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HIGHEST aerial tramway in the world, seen here, is that built by the Caracoles Tin Co., in Bolivia. In its five mile stretch from mine to mill it crosses mountains and valleys, reaching a maximum altitude of 16,000 ft.
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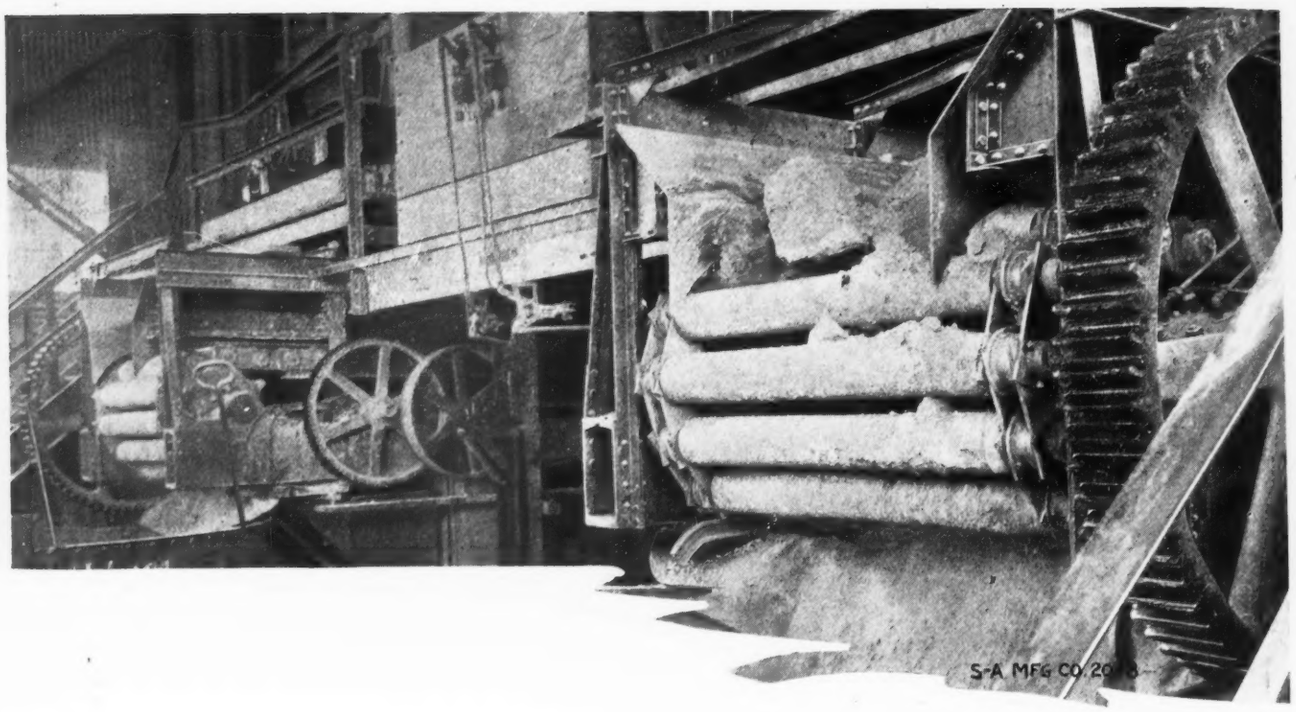
The Story of Tintic Standard
By Arthur B. Parsons

Sintering Zinc Ores
By B. F. Buff

Zonal Distribution of Gold, Silver, Lead, and Copper Ores in Idaho
By Francis A. Thomson and Fritz McGonigle

Biography of David D. Irwin



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ENGINEERING AND
MINING JOURNAL-PRESS

JOSIAH EDWARD SPURR, Editor

Volume 120 New York, August 8, 1925 *Number* 6

Delay in Federal Tax Procedure

IN CONNECTION with the proposal of the Internal Revenue officials to reopen federal tax settlements with all silver mining companies back as far as 1919, it should be pointed out that the government is not the only "offender" in this respect. While the silver producers in general have not been among the active petitioners for recalculation of tax returns, coal, iron, and copper mining companies and oil producers have been conspicuous among the many industrial corporations that have sought to have their back taxes revised downward. Most of these claims for refund have been based on departmental rulings made in recent years, which the taxpayers contend are applicable to their own cases. As a consequence the corporations themselves are in many instances responsible for the failure to have effected a final and conclusive settlement with the government.

When a taxpayer files a claim for refund it means a complete re-audit of the case, and every phase of it should be considered. Frequently some "later rulings" operate to reduce the total tax, whereas others tend to increase it. Frequently the taxpayer wants to have considered only downward adjustments. The government officials, on the other hand, in dealing with the silver producers, are said to have contended that factors that would increase tax liability should be considered to the exclusion of those that would decrease it. The great cost both to the taxpaying corporation and to the government of the continual revision and re-auditing of these old returns is a burden for which both are partly responsible.

This gives a glimpse into the complex, vacillating, and not at all hopeful conditions under which the tax valuation and assessment work is being conducted in Washington. It is a situation that does not promise early amelioration. Our flexible system of legal and other governmental decisions, framed in order that every possible appeal to justice and equity may be taken, results in frequent inability to dispose of public business involving financial considerations through clean-cut and definite decisions. Carefully previsedlegislation, carried out under a well-considered and prearranged plan of administration, would, to be sure, remove most or all of this bungling and expensive delay; but all mortals are erring, and to one who studies many of the acts of Congress, it often seems that Congressmen are more prone to blunder than the average citizen—an illusion, of course, caused by the white light that beats upon Congressional legislation. Add to all this the political pressures brought to bear, in one way or another, upon those higher officials who are political appointees and who are the superior officers of the trained men who do the actual work, and one understands anew that the less business transacted by the government the better, since business privately transacted, in the light of experience, is bound to be more efficiently conducted.

The Geologist Finds a Mine

THE INTERESTING ARTICLE on "Andalusite in California," by Mr. John Melhase, in our issue of July 18, reminds one, among other things, of the part which the U. S. Geological Survey, through its geologist, Dr. Adolph Knopf, played in the development of this novel mine. The outcrop of andalusite in the White Mountains of California is a conspicuous one, which could not fail to be noted by ranchers, miners, and prospectors. Accordingly it was repeatedly located; it looked like "mineral," and indeed it was "mineral." First it was located for silver, but no silver could be extracted, and it was abandoned. Again it was located for phosphate, but the phosphorus was missing. At this juncture, or later, our geologist comes riding down the canyon, sent thither from Washington to study stratigraphy, tectonics, petrology, and all of those subjects concerning which the general public, by which he is paid, knows nothing and cares less. In the outcrops and pits, located along a wide siliceous dike cutting the pre-Cambrian sediments, the geologist notes (as have the ranchers and prospectors before him) an object of interest. He dismounts, passes the halter over his arm, for fear the animal may wander off and leave him ten miles from camp, and recognizes "contact-metamorphic" minerals, including andalusite. Specimens are shoved into the pocket of his canvas coat, to be verified through chemical and optical tests in Washington. In the course of time he publishes a strictly scientific note on the subject in the *Journal* of the Washington Academy of Sciences, in 1917, and later, in 1918, includes the note in a Geological Survey publication. These publications attract the attention of Dr. Jeffrey, the president of a company which could use andalusite for spark plugs and kindred things; and the result is the present mine. A moral may incidentally be drawn that company presidents should study geological articles. Presumably Dr. Jeffrey read concerning the deposit in the Survey professional paper; it would be little short of a miracle if he had read it in the *Journal* of the Washington Academy of Science.

The old adage of prospectors that no geologist ever found a mine receives here another of those death blows that it has been receiving for the last hundred years without affecting its health. It is unnecessary to refer to the discovery by Dr. Ferrier, of the Canadian Geological Survey, of corundum in Quebec; of chromite in Turkey, by Dr. Lawrence Smith in the last century; of the leading part played by geologists in the discovery of diamonds in the Congo, of phosphate in Mississippi and in France, of silver at South Lorrain, near Cobalt, and a thousand lesser instances.

The salient thing about the practical benefit of Dr. Knopf's observations is that this benefit is a byproduct of science. The Geological Survey did not send Dr. Knopf out to hunt for andalusite; he was studying general geological science. The practical application of geology to mining is indeed usually a byproduct of

pure science. The public should recognize in this the practical value of pure science, and support it; for apart from the progress of knowledge, in which indeed it performs its most important function, it throws off sparks that immediately add to the material comfort and prosperity of man. But to ask that the scientist should devote himself entirely to producing such sparks would be to demand the impossible.

The Senegambian in the Wood Pile

FROM LOS ANGELES, according to the post mark, comes a pamphlet containing a piece entitled "Flivver Bill's Last Chance." The author, sailing under the euphonious nom de plume of "Alkali Al," elucidates as follows on the cover: "How a Great Gold Mine Was Found and Lost and the Innocent Grass Widows, Feeble-Minded Real Estate Agents, and Open-Hearted Bankers Protected." As literature, the effort ranges from almost clever to decidedly inferior; and as an effort to belittle the work of the Corporation Commission of California it is a flat failure. Unconsciously, perhaps, the author has shown just why California needs some agency to put as many obstacles as possible in the way of the heads-I-win-tails-you-lose promoter. The unsophisticated public is going to be bilked, but the evil can be ameliorated. The dramatis personæ of Alkali Al's story include:

Bill, a prospector.
Harry, *Bill's* wealthy friend.
A shyster lawyer.
The Corporation Commissioner.
A bob-haired stenographer.
The chief engineer.
Hangers on, prospectors, promoters, stock salesmen, widows, etc.

Compressed to scenario size, the story is this: Bill, after many futile years as a desert rat, makes a big strike—a gold quartz vein 10 ft. wide of ore that strings a pan for 10 in. He goes to Los Angeles, where he looks up Harry, "his old pal," now rolling in wealth. Harry regrets that he has no idle cash, but after some pointless and inexpensive conversation about getting money from his friends, he telephones to a lawyer of his acquaintance and offers him 25,000 of the million shares to be issued, as compensation for drawing up the necessary papers to incorporate the Last Chance Mining Co. Bill is to take 250,000 shares, Harry 250,000, and 250,000 are to be sold to the public at 10c. each to finance operations. Next a permit must be obtained from the Corporation Commission to sell this stock. However, the "layout looks queer" to the Commissioner, and a hearing is ordered. The miscellaneous members of the cast are part of the stage setting at the pathetic hearing, which is described in vivid detail. The upshot is that Bill, mystified by the red tape and legal formalities, and mortified with the Commissioner's alleged suspicion of prospectors in general, goes "plumb nutty," to borrow another of Alkali Al's expressions. The enterprise is, of course, abandoned and the reader is left to bleed in sympathy for poor Bill.

The chances are that it was Harry, not Bill, that the Commissioner suspected, and on the showing made in the story as related he had excellent grounds on which to base his suspicion. Harry is the nigger in the wood pile. These Harrys, these promoters who never risk a cent and play only the sure things, are the real enemy of the poor prospector. What did this man of money contribute to the undertaking? On occasion Harry let Bill occupy an "overstuffed chair" in his luxurious office; and he made a telephone call to the lawyer. In payment for these momentous services he appropriated as many shares as the public would be asked to pay $25,000 to acquire. He did not even advance $100 in cash to get the incorporation papers drawn up; instead he gave the shyster lawyer 25,000 shares of treasury stock—the equivalent of $2,500, at the rate of the proposed public distribution.

Suppose that Harry had put up $5,000 in cash and had asked four of his rich friends to do the same? Suppose that, with the $25,000, Bill had gone out and proved that his prospect was something more than a flash in the pan—that there was a real potential mine. Suppose then that a company were organized for a million dollars and application made to sell 250,000 shares at a dollar per share—instead of ten cents—to raise funds for equipping the property and building a mill if necessary. What would have been the attitude of the Corporation Commission in a case like that? The Last Chance company not only would have got permission to sell shares, but it probably would have found plenty of customers.

On the other hand, suppose that California had no Corporation Commission, what would a sharper of the stripe of this Harry have done? He would promptly have got busy selling his own 250,000 shares for any price he could get, putting the proceeds in his own pocket. When he was through he no longer would have any interest in the prospect, and there would not be a dollar in the treasury to pay for development.

Like many other critics of the blue-sky laws, the person who signs himself Alkali Al would have one believe that he is moved by a yearning sympathy for the unfortunate, much-abused prospector. More likely he is inspired by Harry and his kind, who resent deeply the success of the Corporation Commission in interfering with their operations of defrauding the unsuspecting but greedy public. It is perhaps significant that there is absolutely no way to identify those responsible for the preparation of this pamphlet. Like others who perhaps are not very proud of their cause, they fight anonymously.

The "Mineralizers"

SINCE the beginning of the study of the origin of ore deposits the importance of the volatile elements has been recognized. These are frequently evidenced by minerals that contain them—such as fluorite, which contains fluorine, or tourmaline, which contains boron. Other minerals that do not contain these volatile elements have been shown by experiment to crystallize only in the presence of some of these volatile elements, such as water or fluorine, which have acted as "catalyzers." The occurrence of these minerals in ore deposits, together with the fact that the metallic ores are usually sulphides, containing the volatile element sulphur, has led to the practically universal view, by those advanced students of ore deposits who are magmatists, that the extraction of the ore magma or ore solutions from the original magma has been through the agency of these so-called "mineralizers"—a term that follows the original "agents mineralizateurs"

of the French writers on the subject. The universal conception has been that these more buoyant magmatic elements rose and foregathered, and took along with them the metals. As to the details of this operation, small effort has been made to penetrate the mystery. The whole subject of magmatic chemistry, indeed, is in embryo and obscurity; and is not being advanced by those students of physical chemistry who, in the face of universally accepted facts, insist upon proceeding upon the assumption that the magmas are dry melts. The initial hypothesis being incorrect, their labored deductions are without confirmation. The fact of the importance of volatile elements in magmas, not so evident in the basic rocks, becomes glaring in the siliceous ones; and in the pegmatites and especially in the ore deposits becomes so patent that it has induced universal recourse to a belief in the transfer (inferentially in solution) by these volatile elements or "mineralizers."

The chemistry of an ore magma or ore solution, however, whether that which enables its derivation from the original magma or that which accounts for the varied phenomena of ore deposition, is still unsolved; its literature consists mainly of the vaguest and most unsatisfactory collection of unassorted and unapplied data as to solubilities of metals in different reagents. Certain observations, especially the confirmation of the Zonal Theory, have provided substantial data on which future investigation along physiochemical lines may work; and to this is added the great store of published observations on the paragenesis of different minerals in many ore deposits. The typical association of gold and metals has now been discovered to be due to the fact that both quartz and sulphides are end-products of magmatic differentiation; why they should both be end-products is another chapter, which has not yet even been begun. Those who prate of physical chemistry in connection with ore deposits have not scratched the problem any more than those who frankly confine themselves to the inductive method of legitimate geology.

Profits From Slag

FORMERLY a waste product, iron blast-furnace slag is becoming of increasing utility. Several years ago, as many of our readers will remember, the Illinois Steel Co. began the manufacture of cement from a mixture of powdered slaked lime and finely pulverized blast-furnace slag. This was known as puzzolan cement, and though rather widely used for a time, came to be generally considered inferior to the true portland cements, with which it came into competition, so that it became unpopular. The makers then determined to make a true portland cement from selected slags, with the addition of limestone, so that the product, as made in recent years, has been entirely satisfactory. Now comes a new use for slag, also concerned with the making of concrete, the properly crushed and sized material being used by the Sloss-Sheffield Steel & Iron Co. in place of crushed rock in the making of concrete for construction work of many kinds. Wet concrete so made is being delivered to contractors in Birmingham at a good profit.

Copper or lead furnace slags are not the same as iron furnace slags; the silica content of a copper slag is about the same as that from an iron furnace, and the alumina is usually only a little less, but the 50 per cent of lime and magnesia that the iron slag contains is largely displaced by iron oxide. The difference is, therefore, largely in the character of the base present. It is obviously impossible to make an ordinary portland cement from a copper furnace slag, but the use of such crushed slag in concrete has possibilities that are worth studying. This material has been used for concrete on minor work, we believe; possibly some of our readers can tell us something about their experiences in this direction. It is entirely possible that by properly crushing and sizing, and adjusting other factors, a wide field of use for non-ferrous smelters' slags in the manufacture of concrete can be developed. Such slags have already proved useful in a small way also for launder linings and for railroad ballast.

Why Buy Machinery?

LACK OF CAPITAL prohibits much mine development and operation, as anyone who reads the letters printed in the "Discussion" department of the *Mining Journal-Press* knows, but it can sometimes be surmounted if the operator is sufficiently ingenious and if natural conditions are favorable. On page 187 of last week's issue was published a description of a home-made manganese-washing plant that should take the 1925 prize for avoidance of capital investment. Water is supplied by a spring, from which it is carried by old boiler tubes connected together with discarded inner tubes from automobile tires. The ore is treated in a log washer made from a white oak tree into which old harrow teeth have been driven. A hand jig is used for a cleaner. Power is furnished by belting the log washer to the rear axle of the operator's flivver; when the day's work is completed, he puts the wheel back on and drives home in the power plant. No watchman is needed at night.

This shows what can be done in case of emergency, and such plants have succeeded where more elaborate ones have failed. However, such practice cannot be recommended for most conditions, for metallurgical efficiency is usually sacrificed; in the plant cited, for example, a lot of good manganese is lost in the fine ore. Doubtless proper equipment would more than pay for itself provided the ore deposit were of sufficient extent to justify the investment. The large companies have found that little savings here and there, secured by having the most modern equipment, are well worth the necessary investment. It is regrettable that some small operators cannot afford to cut costs.

Brush Likes European Metal Outlook

TWO increasingly important outlets for American lead and copper in Europe are the development of hydro-electric projects and the expansion of telephone and telegraph systems, according to Hamilton Brush, vice-president in charge of metal sales for the American Smelting & Refining Co., who has just returned from a sojourn of several months abroad. Communication systems, particularly in Germany, have had little attention since 1914 and require not only large additions but thorough rehabilitation. Lead for incasing cables is one of the principal requirements for this work. They are moving heaven and earth to get away from the use of coal in industry, says Mr. Brush, and that of course means hydro-electric development, with the accompanying use of copper.

Mining Engineers of Note

David D. Irwin

"GET YOURSELF sandwiched between good men, above and below." This is the way David D. Irwin explains his rapid rise to the position of general superintendent in charge of operations of the Copper Queen branch of the Phelps Dodge Copper Corporation.

Born in 1887—at Chicago, incidentally—he is only 38 years old, than which many are older who have not such important positions. He says that he has had extreme good fortune in working under excellent men, and further in having excellent men working with and for him. It might fairly be inferred that Irwin was like a very mediocre horse that luckily had always been teamed with two exceptionally fine animals that carried him along through no fault of his own. Those who know Mr. Irwin, however, aver that they have never known his traces to be slack, no matter how good his team mates nor how hard the going.

D. D. Irwin

What attracted him to mining, Irwin does not know. The only interest of any members of his immediate family in mining was the ownership of sundry worthless mining stock certificates and a few equally worthless patented claims in Arizona and Nevada. It seems that most people who are well-to-do enough to have a few spare dollars indulge in this kind of speculation. For no particularly good reason, then, Irwin studied mining at Yale. He completed the undergraduate course in 1908, spent the summer prospecting around Cobalt and came back for the first year of post-graduate work in mining. The next year was spent as sampler and geological mapper for the Detroit Copper Co., now the Morenci branch of the Phelps Dodge Corporation. His immediate superior was the "boss sampler," D. E. A. Charlton, now business manager of the *Mining Journal-Press*. Returning to Yale, he finished the post-graduate course, majoring in geology. A year of practical field work before finishing at a university is a big help to a young engineer.

The next two years were spent with W. Rowland Cox and staff as an assistant geologist and scout engineer on examinations, and as superintendent on prospect work in Arizona, New Mexico and old Mexico. To get a broader operating experience, a superintendent's job on a small prospect was exchanged for a timberman's job with the Detroit Copper Mining Co. From this, promotions to shift boss and then to division foreman came. With M. H. McLean as mine superintendent and C. E. Mills, and later A. T. Thomson, as managers, Morenci was an excellent school, according to Irwin.

In 1915 the Phelps Dodge interests were starting work at their Burro Mountain property in Tyrone, N. M. With a view to getting a broader experience and a better chance for promotion with a newly forming organization, he obtained a transfer to Tyrone. Later he became general mine foreman.

The next move was to Alaska, in 1917, as general superintendent at Kennecott under E. T. Stannard. Examinations of the Mother Lode property between snowslides, the burning of the bunkhouse at the Bonanza mine in midwinter, and the disabling of the Jumbo tramway by snowslides were high spots in this period. He returned to the Southwest in 1919, spending the next two years in the Phelps Dodge Corporation offices at Douglas, Ariz. He was transferred to Nacozari, Mexico, as general superintendent of the Moctezuma Copper Co. in 1920. During the next two years a large construction program, including Diesel power-plant additions, new shops and hoists at Pilares, and remodeling of the concentrator at Nacozari, was under way. In April, 1922, he was transferred to the Copper Queen branch at Bisbee, as general superintendent in charge of operations, under G. H. Dowell, manager. During the depression of 1921, stripping in the Sacramento Hill steam-shovel pit had been discontinued and construction work on the concentrator stopped. Early in 1923 operations on Sacramento Hill were resumed and a year later the first experimental section of heap leaching low-grade capping from Sacramento Hill was begun. Irwin's task at present is to keep the operation of the underground mines, the steam-shovel pit, and the mill and smelter at Douglas tuned at the most economical pitch. A big job for any man!

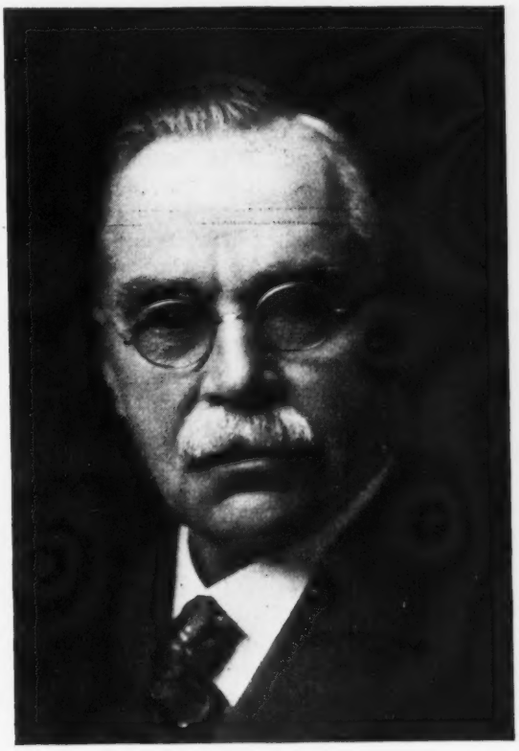
The Story of Tintic Standard

How E. J. Raddatz Overcame Serious Obstacles and Developed the Outstanding Silver-Lead Mine in the United States

By Arthur B. Parsons
Assistant Editor

ALMOST ANYONE out in Utah who professes to know anything about mines—and that includes about nine men out of ten—will tell you that the Tintic Standard mine in East Tintic owes its existence "solely" to the faith, determination, and nerve of E. J. Raddatz. To forestall criticism of the implication in this statement, it may be well to draw attention to the distinction in definition between an ore deposit and a mine. Nature is responsible for the former; but the genius—and maybe the luck—of human beings creates the latter, especially when the ore is buried under 1,000 ft. of worthless rock, as it is at the Tintic Standard.

However, without detracting in the slightest from the credit due to Mr. Raddatz, I think the statement of his admirers should be qualified. Two excellent housewives, each in her own way, and a man who taught history in the Salt Lake high school contributed largely of the "faith, determination, and nerve" that made possible the first discovery of ore in 1916; and an engineer who took direct charge of operations in 1922 certainly should be credited with diagnosing the diseases of the enterprise and restoring it to health after a period of illness in 1921 that easily might have become chronic even if it did not prove fatal.



E. J. Raddatz

Thanks in large measure to James W. Wade, whom Mr. Raddatz made assistant manager in January, 1922, the crisis was safely passed and the Tintic Standard is today the largest producer of silver from silver or silver-lead ores in the United States. The Anaconda Copper Mining Co. alone exceeded it in silver output in 1924; and Anaconda really operates a score of separate mines at Butte. Total production to June 1, 1925, was worth $27,442,500, and the metal in the ore totaled 18,086,000 oz. of silver besides 156,082,000 lb. of lead, 19,680 oz. of gold, and 4,680,000 lb. of copper. Moreover, the reserves of reasonably assured ore contain 25,000,000 oz. of silver, in ore averaging 30 oz. per ton, making what is in all probability the largest proved deposit of silver ore in the United States. The Real del Monte, at Pachuca, Mexico, the Cerro de Pasco Copper Corporation in Peru, the Burma Mines, Ltd., in India, and the Mexican Corporation, at Fresnillo, Mexico, presumably have larger proved reserves, and they, with Anaconda, were the only companies in the world to surpass the Tintic Standard in production in 1924.

The story of the "Standard" divides itself into three parts: (1) The exploration stage, from 1907 to 1916, during which almost insurmountable physical difficulties were overcome at the mine and $407,000 was spent before any ore of consequence was opened. Mr. Raddatz's finding of the money is a rare sample of mine finance. (2) The early production period, during which a second shaft was sunk, an eleven-mile railroad built, and a 200-ton reduction plant erected. During this period more than $10,000,000 was produced and dividends totaling $1,651,067 were paid. (3) The recent production period, starting with 1922, during which the dividend total has been brought to $4,884,963, the operating difficulties that developed in 1920 and 1921 have been surmounted, and the ore reserve has been established.

To start at the beginning: In 1907 Mr. Raddatz, still a "young" man in spite of fifty years of active life, was manager of the old Honorine mine, at Stockton, Utah. In July of that year, the Nevada Consolidated Copper interests held a big celebration at Ely, Nev., to commemorate the completion of the Nevada Northern Railroad, which was to make possible the exploitation of the copper mines at Ruth. Mr. Raddatz was among those present on this occasion. At the barbecue, which was a feature of the celebration, he chanced to meet young John Bestlemyer, of Provo, Utah, who told of some claims he and his father had just patented in the East Tintic district. They were the Union B and Carbonate Queen. In September, after returning to Salt Lake City, Mr. Raddatz went

Dividend, Utah, showing Tintic Standard staff residences, miners' dormitories,

down and looked over the ground. The Tintic district proper had been for more than thirty-five years a prosperous mining camp, but very little attention had ever been paid to the area lying to the east. It was, in fact, pretty hungry looking country.

The Geologists Who Were Wrong

However, Mr. Raddatz was attracted by some big bold outcrops near where the Tintic Standard No. 1 shaft afterward was sunk. He was familiar with some of the rich mines in the western part of the district and the more he studied the brecciation, the fissuring, and faulting on the surface, the stronger became his conviction that the eastern limb of the major syncline ought to be productive. In this belief he got little support from those who professed to be geologists; and no comfort at all from the other operators in the Tintic district.

Nevertheless he bonded the Bestlemyer claims for about $60,000 and located the Copper Queen group of four claims, which cover most of the ground where the mine now is. He formed the Tintic Standard Mining Co. in October, 1907, and became president and general manager, positions he has held ever since. Immediately he assigned the Bestlemyer bond and lease and turned over his own four claims for 75,000 shares of the 1,175,000 for which the company was incorporated. That transaction was unusual. The average promoter would have taken at least 500,000 shares for his assets and his services as organizer.

At the start, most of the money for development came from the proceeds of treasury shares sold by Mr. Raddatz to personal friends and acquaintances. Salt Lake and Ogden people and some Milwaukee capitalists, whom he met a year before, were important purchasers. A 400-ft. inclined shaft failed to reveal anything that might even be mistaken for ore, but it did show formation that encouraged Mr. Raddatz to start sinking a new vertical shaft near by.

From 1909 to 1916, 1,000 ft. of vertical shaft, 4,000 ft. of drift and crosscut, and 700 ft. of inclined winze were sunk and driven. One small lense above the 1,000 level produced eight cars of ore, but that was all in seven years. Moreover, Fate seemed bent on making the work as difficult as possible. After the shaft had passed the 400-ft. point, large quantities of carbon dioxide gas issued from the cracks in the rock; and, as work on the long 1,000-ft. level progressed, the rock temperatures became excessive. There was only one opening, the workings were devious and rather long, so that mechanical ventilation was difficult. J. M. Snow, mining engineer, of Salt Lake, who has always done the surveying and made the mine maps, and an assistant nearly lost their lives on one occasion. A dead layer of nitrogen in the top of the drift and one of carbon dioxide in the bottom left them with only a thin stratum of breathable air. Several hours elapsed before sufficient good air could be blown into the heading to make possible their escape. This illustrates the unfavorable conditions that existed. That no lives have ever been lost seems a miracle, and it is little less remarkable that the work ever was accomplished.

The Part Played by Mrs. Westerdahl

It is in this connection that one of the women to whom I have alluded played her part. John Westerdahl was a Finnish mine foreman who did most of the sinking and driving on contract. Like so many of his countrymen, he was a rattling good miner and he got good men to work with him. But he and his men would never have stuck to their heartbreaking job had it not been for Mrs. John Westerdahl. Mrs. Westerdahl ran the miners' boarding house; she was a resourceful woman, and she kept John at a job that no one could have blamed him for quitting. Those were the days when saloons flourished in Eureka, and after a week of "eating gas and sweating blood" the miners, including the boss, frequently drowned their sorrows in the flowing bowl. Only the tact and resourcefulness of Mrs. Westerdahl had John back on the job on Monday mornings. She it was who made it possible to carry on during seven long years.

To the day of his tragic death in 1920 John Westerdahl was in charge of the mine as superintendent. One evening he entered the company store near the mine and, without warning, was shot down in cold blood by one of the two bandits who were "holding up" the storekeeper. The job of superintendent doubtless grew too big for Westerdahl, excellent miner and foreman though he was. Mr. Raddatz probably realized this, but it is characteristic of him that he stuck to the man who had put so many years of his life into the

boarding house, main hoisting shaft, and homes for married workmen

prospect, after the prospect had become a remarkable mine. Who can say but that, if the choice had been his, John Westerdahl would have preferred to die when and as he did than to have lived to see some other man take his job as superintendent of the Standard? The tragedy of the murder is somewhat softened by the fact that Mrs. Westerdahl receives a comfortable income from the Tintic Standard shares that she and John worked so hard to get.

The Stanchness of Ira D. Travis

But to get back to the $407,000 that Mr. Raddatz raised before the big strike was made. Most of the money came from the sale of treasury shares and from assessments levied against the shares. Nineteen of these "Irish" dividends were declared and a large proportion of them were paid. Each was for only ½c., but even that was something of a burden on many of the small stockholders, who were people of modest means. And virtually all they had on which to base hope was the faith of E. J. Raddatz that he would find ore and find it "big" if he could keep digging.

This faith is illustrated by a little episode regarding the history teacher to whom I think is due some of the credit for the making of the mine. Ira D. Travis is his name. He was a neighbor of Mr. Raddatz in Salt Lake and he had a modest income principally from his salary as a school teacher. He knew little or nothing about mining, but became interested in Tintic Standard. He invested all he could spare, and he continued to buy shares. He paid the assessments as they came along, even though it pinched him at times. On one occasion after he had got in pretty deep, a friend suggested that before he paid any more assessments it would be a good plan to send an independent engineer out to the property and to have him make a report. Here is the substance of Mr. Travis' reply: "That would be useless. If his report were favorable, I would go ahead and pay the assessment; and if it were adverse, I would figure that he couldn't see any further into the ground than Raddatz, and it would simply be one man's judgment against another's. I wouldn't take his say-so against Raddatz', so I'd go ahead and pay the assessment just the same."

That reasoning is open to the obvious objection that Mr. Raddatz' judgment might be warped by desire. Nevertheless, the story is a true one, and I cannot but feel that the stanch backing both with money and with moral support of Ira D. Travis was a factor in the making of the Tintic Standard. Others may have given more money, but no one else gave as much in proportion to his means. How many shares Mr. Travis finally owned when the strike was made, or how many he owns now, I cannot say. I am told, however, that he is the second largest individual stockholder; he is a director of the company, and with the shares selling at $11.25 and dividends totaling about $2 per year, he doesn't have to teach school to live, say, on a modest Cadillac scale. At that he may be teaching history for all I know.

If any school teacher should chance to see this article, he should not read into it any admonition on my part to "go thou and do likewise," because the proportion of winners to losers is very small. At the same time I will say this: if you feel that you must try your luck, an excellent plan is to get behind a man like E. J. Raddatz, in whose judgment you can place confidence and who, at least, you know is absolutely square, and play him to win.

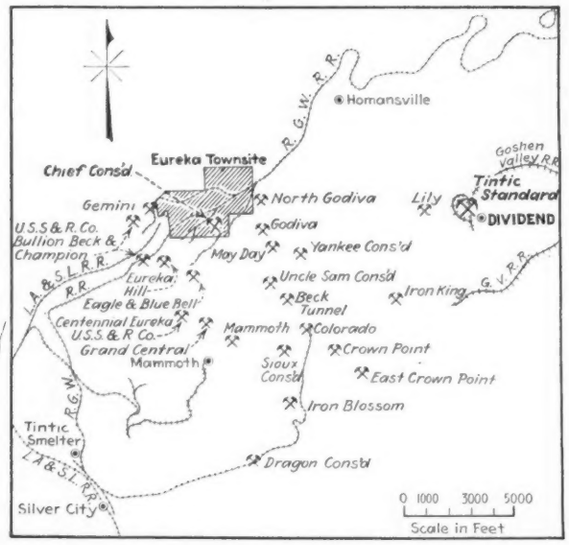
Some of Those Who Stuck and Won

Among the others who came in at the start, stuck through the lean years, and joined in the rich returns when they finally came, are the following directors of the company: L. H. Stohr, general agent for the New York Life Insurance Co. at Salt Lake; G. L. Becker, formerly a brewer and now a manufacturer, of Ogden, Utah; W. I. Snyder, lawyer, of Salt Lake; and Kenneth M. Jacobs, capitalist, of Milwaukee. None of these men was familiar with geology or mining and each backed Mr. Raddatz' judgment rather than his own.

At times the miners and other employees took half of their pay in the form of stock. Sooner or later most of them, however, sold their shares, which were listed on the Salt Lake Mining Exchange, and did not participate in the big profits that came when the mine was made.

There remains to mention the other lady whose faith and courage played so important a part in the story of

the Standard. She is Mrs. Raddatz. Every personal financial resource that her husband could command went into the mine. Mrs. Raddatz uncomplainingly gave up many of the little luxuries of life that she might otherwise have had. As the years went along, it became harder to raise money and the company's credit was bad. Mr. Raddatz owned a ranch in California, which, as he says, they "figured would be a comfortable place for a rainy day." Finally it was mortgaged and



Tintic mining district, in Utah

Many of the well-known mines are indicated, the Tintic Standard being at the right

the proceeds went into that hot hole in East Tintic. In 1916 another financial crisis arose; more cash was needed. Mr. Raddatz had only one more asset that could yield money. That was the family home in Salt Lake City. Should he mortgage it? That was for Mrs. Raddatz to decide. If the mine did not make good they would virtually be "broke" and not so young as they once were. But Mrs. Raddatz did not falter. She was willing to stake her last dollar on her husband's faith in the mine. The home was mortgaged for $10,000 and before that was gone the long winze below the 1,200 level had penetrated many feet into the remarkable shoot of ore that "made" the mine. A proper kind of wife for a miner to have!

However, it was out of the question to mine the ore in the gas-filled workings of No. 1 shaft. Further assessments were levied—and paid more cheerfully—and No. 2 shaft, destined to be the main working shaft of the mine, was started at a point 2,500 ft. northwest of No. 1. On Dec. 27, 1917, connection was made with the old workings. The problem of ventilation was greatly simplified. Immense deposits of rich ore lay ready for stoping.

"Shoot Her High, Wide, and Handsome"

The next few years were much like the corresponding period in the life of many rich mines. Heavier equipment was installed and larger shops, offices, and boarding houses were built. The mine settlement grew. Ore was easy to get and mining was done with no great regard for the future. The policy, as miners describe it, was to "shoot her high, wide and handsome," the orebodies being rich enough to make a highly profitable shipping product without any attempt at selective mining. The limestone held well and huge square-set stopes were left unfilled. One was sixteen floors high and about fifteen sets wide by thirty-five long. The workings gradually became hotter, but more fans were installed as needed to make conditions bearable.

An eleven-mile standard-gage railroad was built from the mine to a point on the Eureka branch of the Denver & Rio Grande Railway which was selected as a site for a reduction plant. The availability of an adequate supply of water had been a determining factor in the decision to build this plant so far from the mine. To the casual observer it would seem that, as a very much shorter spur would have served to provide railway connections, it would have been a better policy to erect the reduction works near the mine and save not only the large investment in the railroad but the cost of a rather long haul of the ore. While I have no official statement to the effect, it is my understanding that this would be the program if the thing were to be done again.

Unable to Supply New Treatment Plant

The plant was designed and erected by W. C. Madge, who consulted with Theodore P. Holt and George C. Dern, co-inventors of the Holt-Dern roaster. The process is essentially a chloridizing roast followed by an acid-brine leach as successfully applied to Tintic ores by the Tintic Milling Co. It will be described at length in an article that will follow this.

The plant cost $580,000 and was put in operation early in 1921. It has a rated capacity of 200 tons per day, but it soon developed that the mine, in the condition in which it then was, could not supply an adequate tonnage of ore of the grade and composition for which the plant was designed. As a matter of fact, the ore actually handled at the plant did not return as much net profit as if the same ore had been shipped to the smelter, and the discontinuance of operations was seriously considered.

In the meantime, conditions at the mine had grown worse. One or two bad caves occurred, and the big open stopes around the main shaft seriously threatened to put it out of commission. On top of all of this, development and exploration work had been neglected and neither the supply of immediately available ore nor the future reserve was encouraging.

This was the admittedly gloomy situation at the beginning of 1922, when the third period in the Tintic Standard story commenced. It was marked, incidentally, by the passing of two quarterly dividends, in accord with the new policy that called for the reestablishment of the enterprise on a sound basis irrespective of what might happen to the stock market.

A record of smooth operations is interesting and informing; but of far more value is a description that includes difficulties encountered and of mistakes made, if it is followed by an account of how they were overcome and corrected. In a forthcoming article on the Tintic Standard I shall discuss with considerable engineering detail some of the steps that were taken to straighten out the situation that has just been described. Here I shall merely outline the features of the work so as to bring this story of the Standard up to date.

Stope Filling—The most urgent and the most ticklish problem was the saving of No. 2 shaft, certain portions of which ran through thin pillars between

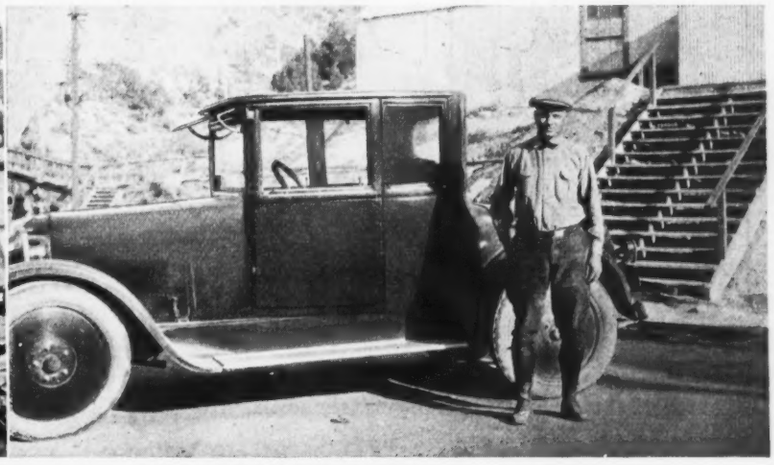
huge empty stopes. An open cut in the hill near the shaft was started, and for several months hundreds of tons of waste each shift were poured into the most important stopes. During 1922 a total of 200,000 tons was used, something more than 40 per cent coming from underground development. Now current operations call for the regular filling of the sets as rapidly as mining proceeds. Cleaner, safer, and, in the long run, more economical mining is the result.

Ventilation—High labor turnover and low individual efficiency of the underground workers were accounted for in a large measure by the intense heat and the inadequate ventilation. In recent years a complete system of mechanically controlled ventilation has been established, whereby 80,000 cu.ft. of fresh air per minute is drawn in through No. 2 shaft, circulated through the workings and expelled through No. 1 shaft. The mine engineer observes and charts the air currents and by means of fans—there are about twenty-five of them—pipes, brattices and electrically operated doors of ingenious design, remote working places are supplied with air. A reduction in labor turnover to about one-fifth the old rate, and an increase in output from less than 1 ton to 1.7 per man-shift are believed to be largely attributable to improved ventilation.

Selective Mining—A characteristic of the ore deposits is the intermingling of layers or bunches of ore of different type, the particular distinction being between siliceous, or dry, silver and lead-silver ore. Adjacent sets may be entirely different; or the top of a face may assay 1 per cent lead and the bottom 40 per cent, while both contain 60 oz. silver per ton. Obviously, if the two ores could be separated and sold under separate smelter contracts instead of being shipped in one lot, an immense saving in smelter charges and penalties could be effected. With this end in view, an efficient system of sampling and assaying was introduced and arrangements were made so that several distinct classes of smelting ore might be mined, trammed, and hoisted. Figures showing specifically the advantages of this selection will be given in an article that will follow this.

Supplying the Reduction Plant—The operations of 1921 showed conclusively that the company's own reduction plant could compete successfully with the custom smelters if the ore supplied contained less than 4 per cent sulphur and more than 15 oz. silver. The problem then was: Could the mine be made to produce 200 tons per day of ore of this class? Here again the question of careful control of mining entered, for the reason that the sulphur content of the medium-grade ore varied widely, adjacent sets ranging from 2 or 3 per cent up to 20 per cent. By keeping five or six separate stopes always available, it was found that a mixture could be drawn answering the requirements as to both sulphur and silver. Incidentally much improvement in recoveries has been made at the reduction plant in the last year or two and it is now making good earnings for the company.

Ore Reserves—The last of the major problems that presented itself in 1922 was that of future ore reserves. A number of the best structural geologists obtainable were called into consultation and a plan of development was laid out. The results were remarkably gratifying. To an already good reserve huge additions have been made, until, as I remarked, the ore deposits as now proved place the Tintic Standard among the first four of five silver mines in the world. So well



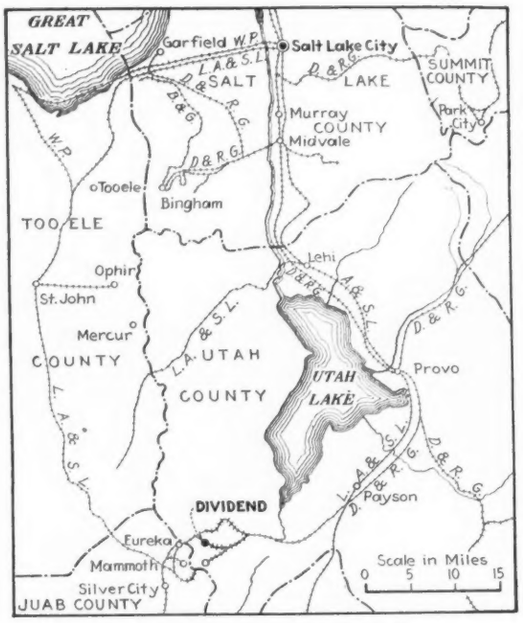
At the Left—Headframe at No. 2 shaft. Through this single opening the entire production of the Tintic Standard, amounting to approximately $27,400,000, has been hoisted.

Below—James W. Wade, assistant general manager of the mine, near the foremen's change house. In this car he drives back and forth to Salt Lake City once or twice a week.

is the development work advanced today that it is possible to regulate mining by the market for metals. Big blocks of particularly rich dry silver ore are available for stoping when silver is high and lead is not so high. It is not a question of getting tonnage, but of selecting the ore that can be mined with greatest profit at a given time.

Credit Due James W. Wade and Staff

In recounting them, the need for these things seems obvious, and the execution of them comparatively simple. However, those who are familiar with such matters will readily appreciate that the performance of Mr. Wade and his staff has been highly creditable. Incidentally he is an advocate of ample engineering supervision. Daily operating and production reports are unusually complete—some might think uselessly



Map showing part of Utah

At Dividend, near the bottom, is the Tintic Standard mine

detailed. However, the cost of collecting and compiling the data is small compared with the saving effected through the intimate knowledge of conditions that is reflected in these reports. They are completed each noon for the preceding 24-hr. period ending at 7 a.m. Among the things shown are: labor cost per car from each working place; cost per car for entire mine, including all labor, supplies, and power; production from each level of each class of ore; cost per ton of ore; cost per ounce of silver; cost per ounce of silver with lead credited; total value of ore produced; net profit for the day. The cumulative figure for the current month to date is also reported for the major items. The theory of the detailed daily report is not so much to *prevent* fluctuations as to *see* the fluctuations and to find an adequate cause for them. If they cannot be explained, something is wrong, and the sooner it is corrected the better.

Dividend, as the mine settlement is officially known by virtue of the post office name, is about five miles from Eureka and is therefore a fairly independent community. Since I was there last summer a much larger water supply has been provided, and I understand that thriving lawns and gardens have added greatly to the appearance of what is in many respects an ideal mining "camp."

Tintic Standard Dividends

Year	Amount	Year	Amount
1917	$81,704	1923	$581,750
1918	371,169	1924	1,149,000
1919	552,109	1925 (first half)	1,268,206
1920	469,880		
1921	176,205	Total to date	$4,884,963
1922	234,940		

The superintendent of the mine is Lester R. Dobbs, and the mine engineer is M. D. Paine. At the mill, Harry P. Allen is superintendent. Mr. Madge, construction engineer for the mill, makes his headquarters in Salt Lake City. Mr. Wade spends about half of his time at the mine and mill and the rest in the Salt Lake offices. Mr. Raddatz, still vigorous and active in spite of his sixty-eight years and a strenuous career, leaves operations pretty much in the hands of his assistants; though he is deeply interested in the exploration and development of a number of other virgin properties in the East Tintic district. But if there be any virtue in the laws of probability and chance, he will not find another "Standard."

Talc and Soapstone in 1924

The total quantity and value of talc and soapstone sold by producers in 1924 was 203,821 short tons, valued at $3,515,556, according to the Geological Survey. These figures represent an increase of 4 per cent in quantity and of 17 per cent in value over the amounts for 1923. There were twenty-seven producers in 1924, as compared with twenty-five in 1923.

The following table shows the quantity and value of talc and soapstone sold in 1924, by states, and the percentages of increase or decrease from 1923:

State	1924 Short Tons	1924 Value	Per Cent of Total Quantity	Percentage of Increase or Decrease from 1923 Quantity	Percentage of Increase or Decrease from 1923 Value
New York	78,340	$1,162,488	38	+ 10	+ 8
Vermont	61,653	573,747	30	— 8	+ 8
Virginia	28,219	1,306,388	14	+ 8	+36
California	16,335	247,799	8	+ 1	+10
Pennsylvania and New Jersey	8,281	83,296	4	+ 1	+ 1
North Carolina	6,093	81,523	3	— 6	— 9
Maryland	3,015	29,767	2	+420	+17
Georgia	1,885	30,548	1	+137	+84
	203,821	$3,515,556	100	+ 4	+17

The talc industry in New York in 1924 was prosperous, and the sales showed substantial increases in quantity and value over 1923. A new use for talc as an ingredient in concrete to make it waterproof was reported to the Survey by one company, which made experiments with favorable results. This company has also experimented with special grades of talc as a high-grade paper filler, and the results are reported to be satisfactory.

The year opened in Vermont with increasing firmness in prices over 1923. The demand was good and remained so until the end of April. A quiet two months followed, and in July signs of improvement were again noticeable, with a gradual tendency toward better conditions until about the first of November, when the demand again declined.

In the South soapstone was mined with renewed activity in North Carolina and Virginia; in Maryland there was a gain of two producers and greatly increased sales over 1923, and in Georgia sales of talc crayons were noticeably larger.

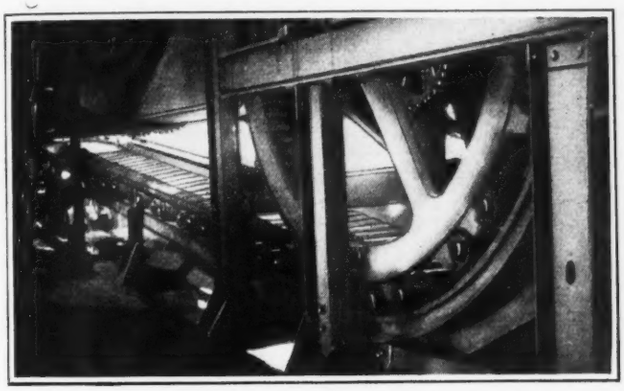
Sintering Zinc Ores

First American Installation, at National Zinc Co.'s Bartlesville Plant, in Operation for a Year and a Half, Makes Good Record for Economy and Efficiency

By B. F. Buff
Assistant Superintendent, National Zinc Co., Bartlesville, Okla.

THE FIRST MACHINE for sintering zinc ores preparatory to charging in a distillation furnace in America was erected at the Bartlesville plant of the National Zinc Co. in November, 1923, and operation began the following month. The machine was furnished by the Dwight & Lloyd Sintering Co., being a standard straight-line type with an estimated capacity of 100 tons per day. It is listed as a 42x264-in. machine.

Before the installation of the sintering machine all the roasted ore used in the plant was prepared in Zellweger kilns, more or less modified, each kiln having



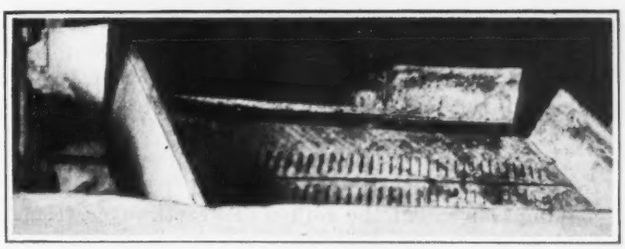
Pallets returning under machine to large sprockets. Wind boxes at upper left

a capacity of approximately 50,000 lb. of roasted ore per day and requiring about 750,000 cu.ft. of natural gas per day to furnish heat. The plans made for the sintering process required that the ore be preroasted to about 10 per cent of sulphur before delivering to the sintering machine. The machine was therefore placed adjacent to the bins into which the ore from the Zellwegers is elevated. Ore is drawn through spouts from the preroasted-ore bins into a bucket on an electric monorail hoist, weighed on a scale suspended from the hoist, and dumped into a hopper that feeds a bucket elevator. The elevator delivers into either one of four small feed bins of about 6 tons' capacity each, the ore being diverted by spouts with slide gates in them. One of the feed bins is used for returning sinter, one for low-sulphur preroast, one for high-sulphur preroast, and the other for green ore. Their functions will be explained below. Under each feed bin is a slow-moving endless belt feeder that delivers a quantity of ore, regulated by slide gates on the bin, into the boot of another elevator. The feed belts are all geared together and driven by a belt from the speed changer, which regulates the speed of the sintering machine. Two of the feed belts (those under the green ore and return-sinter bins) are operated through a clutch mechanism so that they may be used or not at the operator's will.

Discharging simultaneously from the feed bins, the different grades of ore are more or less mixed as they are picked up by the elevator and discharged on the third floor above, but the mixing is completed in a paddle mixer into which the ore is received. The mixer is 6 ft. long and has 14-in. double-blade paddles. Over the last half, water is admitted through a perforated pipe connected to a pressure-equalizing tank in which a constant level is maintained by float valves. A needle-point valve between the tank and perforated pipe regulates the moistening of the ore.

From the mixer the ore is discharged into a swinging spout, the lower end of which moves back and forth across the pallets as they pass underneath an apron for regulating the depth of charge on the grates. Back of the feed apron, and under the mixer, a feed hopper for coarse sinter ($\frac{1}{4}$ to $\frac{3}{4}$ in.) is placed, and the slide gate in front of it is adjusted to provide a layer about $\frac{3}{4}$ in. thick of this coarse material to prevent the fine charge from running through and clogging the grates. This coarse sinter, called "hearth layer," is elevated intermittently from below in a separate elevator. The source of this material will be noted later. The total thickness of the charge bed is approximately 5 in.

In coming under the leveling apron, the charge bed shows some surface cracks where it has been scraped back, and to even the top of the bed, a steel wire brush as wide as the pallet bears lightly on it as it passes to the ignition furnace. Under a clay furnace about 4 ft. long the charge is subjected to a white-hot gas flame over the full width of the pallet and extending



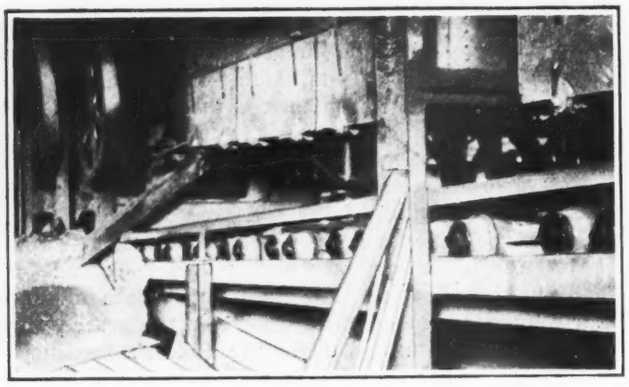
Pallets being delivered on working floor under hearth-layer hopper

Note clean grates. Grates become fouled only when an improper charge is being run. They are left practically clean when they jar off the sinter at the end of the machine. Besides this fall they are jarred by the fall of each succeeding pallet while they are returning upside down underneath the machine. Ore is less likely to stick to them when they are hot, and last winter a gas burner was installed to heat them before they received the charge

1 to 2 ft. in length, according to the kind of ore being used. At the same time, the pallet arrives over the first wind box and a partial vacuum of 10 to 13 in. of water, induced by a fan, pulls enough air through the ore to produce autogenous roasting and sintering. After passing over the two wind boxes, the sinter is cooled and dampened by water distributed across the width of the pallet by a perforated pipe, more or less water being used according to the temperature of the sinter. It is then cracked by passing under a set of

three disks with spikes on them to break up the sinter more readily when it is dumped from the machine. The sinter is dumped on to a rotary grizzly-feeder having ¾-in. openings. The material that falls through is received by a chain elevator, which delivers it to a trommel screen 4 ft. long, covered with 3½-mesh No. 11 wire screen. The fines, containing most of the unsintered material, go to the returned-sinter feed bin. The oversize is elevated for hearth layer.

From the grizzly the coarse sinter is fed into a set of 14x16-in. rolls that have been provided with spikes made of 1-in. round iron, sharpened on the end, and



Clean-out doors on wind boxes

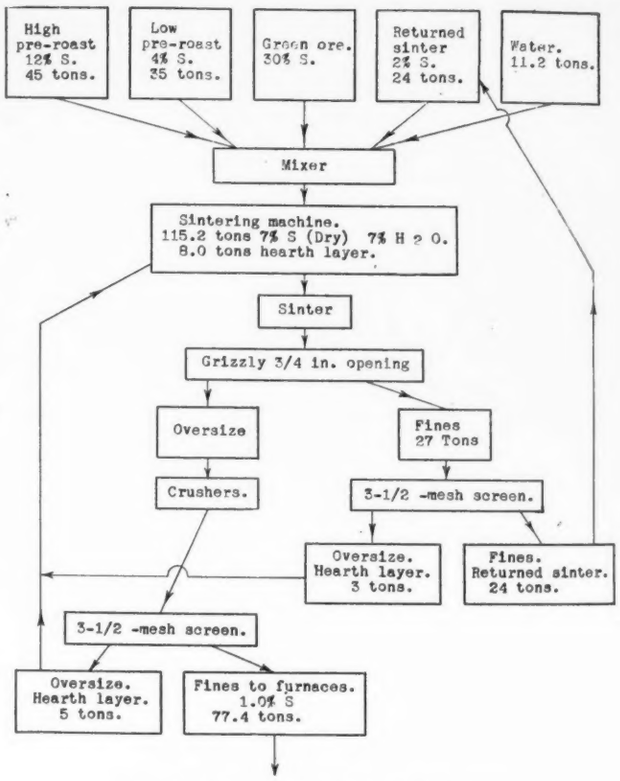
Ore from the wind boxes is mixed with returned sinter and run over the machine again

extending about 1½ in. from the shell of the rolls. Below the spiked rolls are a set of 24x24-in. rolls, which reduce the sinter to about ½ in. maximum lump. A chain elevator then delivers the crushed sinter to a 12-in. belt conveyor, which discharges into a trommel screen 8 ft. long, covered with 3½-mesh No. 12 wire screen. The screenings fall into the finished-sinter bin ready to charge to the retorts, while the oversize is spouted into a separate bin to be used as hearth layer. When there is not enough of this oversize to supply the machine with hearth layer, the smooth rolls are opened up enough to make up the deficiency. On the other hand, when there is a surplus of hearth layer, the excess can be spouted to another small set of rolls, crushed, and elevated back into the finished-sinter bin.

The same monorail runs alongside the preroast bins, feed bins, finished-sinter bin, and hearth-layer bin, making convenient the return of hearth layer from the final screen to the machine.

Sulphur in Preroasted Material a Critical Factor

One of the chief difficulties in operating the sintering plant has been the varying sulphur content of the preroasted ore. When the Zellweger kilns were used for making a complete roast, no difficulty was found in keeping the ore uniformly roasted to about 0.3 per cent "faulty" sulphur, meaning the difference between the total sulphur content and the calculated amount of sulphur combined with lime and magnesia. When the sulphur content of the ore leaving the kiln is allowed to reach 5 to 15 per cent, it has been learned that even with the closest attention the sulphur content varies 2 or 3 per cent from day to day—even from shift to shift. Two reasons are given for this: First, the construction of the kiln is such that close regulation of the draft is impossible; and second, the fineness of the ores as received varies. When making a dead roast these factors did not require such careful consideration, as it is difficult to harm the ore much by roasting it too low, so the kiln fireman made it a point to get it low enough. But for the sintering machine, ore roasted too low is just as bad as ore containing too much sulphur. These difficulties were not anticipated when the plant was designed, and only two feed bins were erected at first, one for preroast and the other for returning sinter. After a short run, during which the preroast, if too high, was mixed with dead roast ore, or if too low, was mixed with green ore by hand, two more feed bins were added and two Zellweger kilns were used for roasting instead of one. One kiln is used to furnish a high-sulphur preroast and the other a low-sulphur preroast. By using separate feed bins for each kind of ore, the operator can adjust the sulphur content of the charge at will. As provision against the inevitable time when, for some reason, both


High pre-roast 12% S. 45 tons.
Low pre-roast 4% S. 35 tons.
Green ore. 30% S.
Returned sinter 2% S. 24 tons.
Water. 11.2 tons.
Mixer
Sintering machine. 115.2 tons 7% S (Dry) 7% H 2 O. 8.0 tons hearth layer.
Sinter
Grizzly 3/4 in. opening
Oversize
Fines 27 Tons
Crushers.
3-1/2 -mesh screen.
Oversize. Hearth layer. 3 tons.
Fines. Returned sinter. 24 tons.
3-1/2 -mesh screen.
Oversize. Hearth layer. 5 tons.
Fines to furnaces. 1.0% S 77.4 tons.

Typical flow sheet for Joplin ores

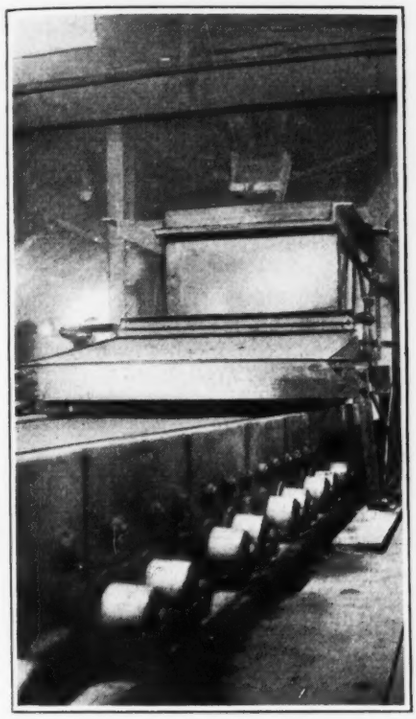
kilns are producing preroast that is too low in sulphur, a feed bin for green ore was supplied. When both kilns are preroasting too high, the sulphur content can be reduced by returning sinter from the finished-sinter bin.

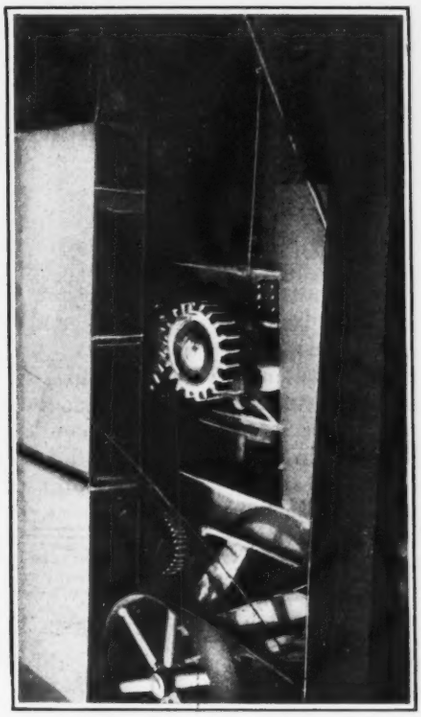
With the present arrangement, about 25 to 30 tons of screenings returns to the sinter feed bin from the grizzly for every 100 tons of preroast charged. Besides reducing the sulphur content of the charge, and making the ore bed somewhat more porous, the returned sinter contains practically all the unsintered material left after passing the charge over the machine. Of these three functions, the last is the most important. A preroast at 7 per cent sulphur is almost as easy to make as one at 10 per cent. The machine has frequently run for two or three shifts without any returned sinter,

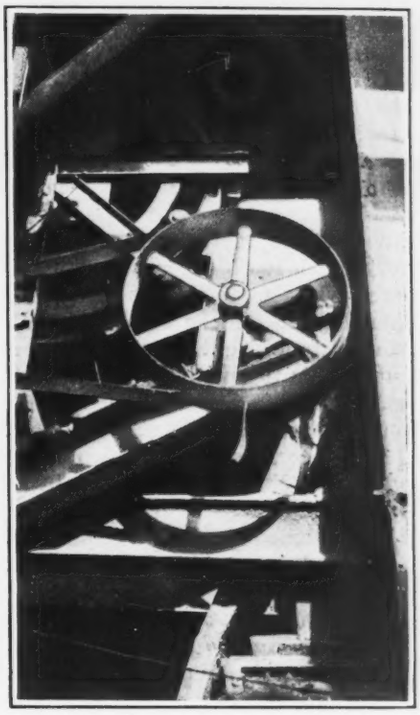
when the preroast was low, with no material difference in the speed of sintering or quality of the sinter produced. The machine frequently runs for hours, when an unusually uniform preroast is being fed, with a returned sinter that would be satisfactory for charging to the retorts, but because of slight irregularities of the preroast, even as now handled, it is impossible to depend upon every pallet of ore being perfectly sintered, and with no separation of unsintered material, the average sulphur content of the sinter is too high.

The depth of the layer of ore on the pallets seems to have a surprisingly small effect upon the speed of the machine. One expects that if a 4 in. thick bed requires a speed of 1 ft. per minute, a 2-in. bed would allow the machine to run at a speed of 2 ft. per minute. This is not at all true, however, and the practice here is to run the pallets as full as practicable. It has been found also that the smallest pile of charge possible to keep the pallets full to the bottom of the leveling apron is best, since the ore is packed less than with a deep pile.

Next in importance to the sulphur content of the charge is the control of the moisture. A perfectly dry charge will not sinter. The top will be heated to the igniting temperature under the ignition furnace, but very little air penetrates through the bed and the burning ore soon smothers out. On the other hand, too much moisture will prevent ignition. It is probable that the proper amount of moisture is that amount which causes the ore to occupy the greatest amount of space. It is well known that a cubic foot of moist ore weighs less than a cubic foot of the same ore when dry. When the water is evaporated by ignition on the sintering machine, it is replaced by voids that permit free passage of air. Whether this theory is correct or not, practice teaches that one ore requires 10 per cent of moisture to sinter properly, whereas another may need only 6 per cent. The operator judges the proper moisture by squeezing a handful of the ore. If it retains its shape when he opens his hand, it is too wet. It should just crack apart. He also judges by the appearance of the cracks as the ore issues from beneath the leveling apron. He also tests the bed by tapping lightly with a rod as the pallet comes from under the ignition furnace. If the moisture or sulphur is too high, the crust is too hard; or if either is too low, there is little or no crust. When the conditions are exactly right, the rod should just break through at the edge of the furnace, but not break through 2 ft. further on. The machine is sensitive to even a slight change in either the sulphur or the moisture content of the charge, and to make the regulation of water easier the float tank mentioned above was installed.







(Left) Working floor of machine, showing swinging spout, leveling apron, and ignition furnace

The maximum speed of the pallets over the wind boxes is a little more than 2 ft. per minute. There is an interval of about 12 minutes between charging and discharging a pallet

(Center and right) Machinery for crushing sinter

Belted pulley drives grizzly-feeder. Just below in middle picture are seen the end gears of the spiked rolls, and below them the smooth rolls. The elevator delivers crushed sinter to a belt conveyor above. At right is shown another view of the sinter crushing machinery, showing discharge end of sintering machine

Ignition of an ore that contains considerable iron is comparatively simple, but to ignite Joplin ore properly requires a searing, white-hot flame at least 18 in. long. Considerable experimenting with different furnaces led to the development of the one now in use. It consists of thirty bunsen type burners, side by side, extending across the width of the pallet, and inclined from the horizontal at an angle of 45 deg., pointing down at the bed and toward the discharge end of the machine. The nozzles through which the gas issues are welded into a gas pipe manifold, which can be moved closer to or further away from the mixing tubes, to regulate the amount of air drawn in with the gas. The mixing tubes are formed in fireclay tile made in the plant pottery, two corrugated tile being clamped together to form a series of thirty 1-in. holes 12 in. long, into which the gas feeders discharge. The sides and

top of the furnace are made of fireclay tile, supported by structural steel. This furnace gives practically a continuous sheet of flame over the full width of the pallet and can be turned up to give a length of about 30 in. From 30,000 to 40,000 cu.ft. of gas at ½ to 1 lb. pressure is required daily.

How Proper Sintering Is Determined

By punching holes through the bed of sintering ore, the operator is able to determine how the sintering is progressing at different points over the wind boxes. The vacuum gages connected to each of the two wind boxes and the appearance of the stack discharge also inform him whether his charge is running "hot" or "dead." Of course, the most positive indication is the appearance of the sinter when it is discharged from the machine. It should be well stuck together, but easily broken. Ideal Joplin sinter shows some of the larger grains of ore unsintered, and is dark brown. With too much sulphur in the charge, the sinter is hard, black, and shot through with shiny crystals of sublimed zinc oxide. If the sulphur in the charge is either very much too high or very much too low, soft, unsintered white material lies next to the grates and clogs them badly. If the sulphur is too high, the machine can be stopped until the sulphur has time to burn out; but if it is to low, it has smothered out and must pass on, depending upon the grizzly to bypass it to the returned sinter. After a year and a half of experience the operators are able to keep their charge within comparatively close limits merely by observing the points mentioned above. When the machine was first started, a great amount of laboratory control was necessary. Samples for each shift were taken of preroast, charge, and sinter, and frequently several samples were taken during the shifts to help the operator find himself. They have now largely been dispensed with as aids for the operator, only such being taken as are necessary for stock keeping and checking the quality of the sinter.

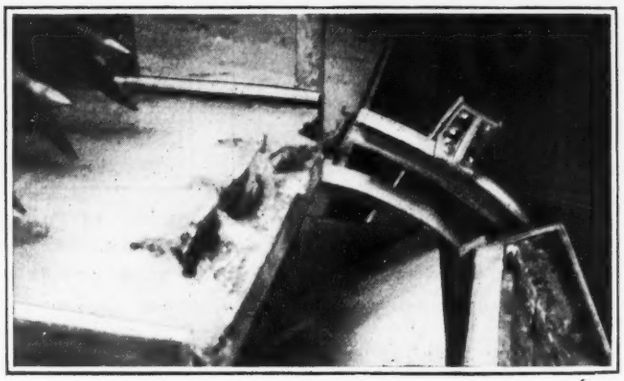
Practically no sulphur is left in the sinter when all the conditions are most favorable, selected samples containing as low as 0.05 per cent sulphur. To obtain sinter containing less than 0.5 per cent sulphur, however, requires that the speed of the machine be cut down considerably, and in this plant it is the practice to produce sinter from second-grade Joplin ores containing about 1.0 per cent sulphur. Practically all the sulphur in sinter exists in the form of zinc sulphide, whereas much of the sulphur in ordinary roasted ore is in the form of sulphates. Not only does the sintering process prevent the formation of sulphates, but it will also break up sulphates in such materials as old kiln beds when they are dug up, crushed, and mixed with the charge.

The proper sulphur content of the charge depends upon the nature of the ore, probably chiefly due to the iron content. A high-iron ore can be sintered with the removal of more sulphur than a low-iron ore, the shrinkage being greater, hence greater porosity and less obstruction to the draft. A Western ore containing 8½ to 10 per cent iron was sintered with the sulphur content of the charge about 11 per cent, whereas Joplin ore sinters best when the charge contains about 7 per cent sulphur.

One of the advantages of sintering is that fine ores and slimes are converted into a more granular condition, and work about as well, both in the process of sintering and later when charged in the distillation furnaces. It is interesting to note that the idea of sintering has been somewhat modified from lead blast-furnace practice. In the blast furnace, comparatively large lumps free from fines are desirable, whereas for the distillation furnaces it has been found necessary to reduce the sinter to pass a 3- or 4-mesh screen for best results, in spite of the porosity of the material. This is, no doubt, because zinc ores are reduced much more rapidly by actual contact with carbon than by carbon monoxide gas.

With the present preroasting equipment only about 80 tons of preroast can be produced, and the capacity of the sintering machine is limited thereby. Experience has indicated, however, that 80 to 90 tons per day on the average is enough to expect from the sintering machine unless a more uniform preroast is supplied. Runs on the sintering machine totaling more than 100 tons are frequently made in 24 hours. The high tonnage day for Joplin ore so far has been 113 tons, whereas on a short run of irony jig concentrates, 150 tons has been sintered in a day. The daily average tonnage for a month runs from 75 to 80 tons preroast (83 to 88 tons green ore). This includes, of course, all time lost on account of shut-downs, repairs, etc.

The power required for the fan is 50 hp. A 15-hp. motor drives the machine and feed mechanism, and a 30-hp. motor drives the crushing machinery. Calculated to gas burned under boilers at this plant, the power is equivalent to about 100,000 cu.ft. per day. This, added to the gas used in the ignition furnace, makes a total of, say, 135,000 cu.ft. of gas per day



Discharge end of machine

Spikes shown are 1¼x1¼-in. square iron drawn to a point and bolted to a cast-iron disk keyed to a shaft. The points reach almost to the grates. The disks are rotated by the movement of the bed of sinter into which the spikes dig. Note shrinkage of bed during sintering shown by dark line on side of pallet

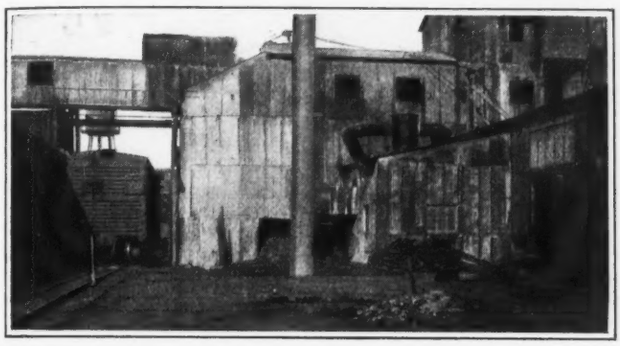
used to sinter 80 tons of ore. The preroast kilns use about 1,100,000 cu.ft. of gas, a total of 1,235,000 cu.ft. To make a complete roast of this quantity of ore on Zellweger kilns, about 2,500,000 cu.ft. of gas would be required. Thus an enormous saving has been effected. With properly designed preroast kilns, the use of gas or other fuel can be entirely eliminated, there being enough heat from the combustion of the sulphur to propagate the reaction when the heat is conserved as in Wedge or Herreshoff furnaces. All the heat then required to remove the sulphur from 80 tons of preroast, including that used for power, could be supplied by 250,000 cu.ft. of gas, at most, compared with 2,500,000 for Zellweger kilns.

Three men are required on each shift, one to operate the machine and two to draw, weigh, and elevate pre-

roast, returned sinter, and hearth layer. The arrangement of this machine is such that the hearth layer and returned sinter are handled by hand, but a proper arrangement could easily provide for automatic handling of these materials. Even with the adverse conditions mentioned, however, the cost of converting green ore into sinter is 75c. per ton less than dead roasting green ore on a Zellweger kiln. At a capacity of 75 tons each, with two sintering machines with autogenous preroasters and labor-saving material-handling machinery, the total direct cost of converting a ton of green ore into sinter can be cut to from $1 to $1.25.

Dust Losses Not Excessive

Although the machine has not been operating long enough to make accurate dust-loss figures available, the present indications are that they are about the same



Fan house and stack

Monorail hoist telpher is shown over the car and below the belt conveyor house

as those occurring in the regular dead-roasting kiln, or possibly a little higher. Approximately 2 tons of ore is cleaned out of the wind boxes every second day, the time required to clean them being about 30 minutes. All machinery is shut down once a day for a thorough oiling and inspection. This requires 15 to 20 minutes, all hands helping the regular oiler on this job. Besides the material mentioned above, about 2 or 3 tons a day of sinter falls between the pallets when they break apart at the discharge end of the machine. This sinter is periodically removed by yard labor. The coarse sinter is picked up with coke forks and crushed for charging the furnaces. The fines are fed into the returned sinter screen. This is another place where machinery can eliminate hand labor.

The gas leaving the exhaust fan contains only 1 to 1.5 per cent sulphur dioxide and is about 115 deg. C. in temperature. This is too low in sulphur dioxide for an acid plant, but it has been suggested that this gas might advantageously be used to supply oxygen for the preroast kilns, being enriched thereby to a point where the resulting gas could be used for acid making.

In the distillation furnace the behavior of sinter is somewhat different from ordinary roasted ore. Over a period of several weeks, temperature records for several furnaces were made for each hour between 9 a.m. and 3 a.m. During these tests there was little difference in the temperature of the furnaces, whether the retorts contained sinter or roasted ore. Yet, with charges containing the same amount of metal, the sinter produced comparatively more metal on the first draw, less on the second and third, and about the same on the last. The following table is a typical furnace record of plates of metal from each draw:

Draw	Roasted Ore		Sintered Ore	
	Blue Powder	Charge	Blue Powder	Charge
1	17	33	16	47
2	22	57	22	52
3	25	53	23	46
4	11	20	12	20
Total	75	163	73	165

Because of the greater specific gravity and porosity of sinter, about 5 per cent more is charged than of roasted ore, with recoveries just as good or a little better. A cubic foot of Joplin sinter weighs from 155 to 170 lb., according to how it is crushed, compared with 120 to 140 for Joplin roasted ore. There is somewhat less blue powder formed, and there is less tendency to form "frogs" in the condensers when sinter is worked. It is also more uniform in size and character, as delivered to the retort, than ordinary roasted ore.

In my opinion, the sintering plant for zinc ores is highly preferable to any method yet devised for eliminating sulphur, from the standpoint of economy, efficiency, and future possibilities. It offers a new field for development along several lines, such as calcining carbonates, sintering baghouse material, and fluxing irony ores before charging to retorts.

New Clutch Drums for Old

Cutting cast iron with the oxy-acetylene blowpipe costs more than cutting steel of the same thickness, according to *Oxy-Acetylene Tips*. The operation takes more time, uses more oxygen and acetylene, and is a little harder to handle. Still, regardless of this, there are many times when the very fact that cast iron can be cut with the oxy-acetylene blowpipe makes possible the rapid completion of work that otherwise would take weeks, or that could be handled in no other way.

In figuring the cost of doing a piece of work, very often there are features aside from the operation that have the deciding effect on the net result. Time is a principal factor. Where a great delay would be encountered if one operation were employed, as compared with immediate results from a more costly process, in a great many instances the process that is more costly in itself is the cheaper in the long run. This factor, and the saving of labor, affected the decision to convert a long-boom dredge into a short-boom dredge. In this work it became necessary to lighten the clutch drums. It was thought that if some proportion of the metal of the two clutch drums could be removed, it would relieve excessive wear on the pinion gears, and would permit the winches to act more quickly.

These two clutch drums were 15 ft. in diameter and of gray cast iron 2 in. thick. It was figured that if eight triangular sections could be cut out of each, the proper weight and balance would be properly obtained. It was important to do this work in place so that the cost of dismantling the dredge machinery would not be excessive. It was also desired that the work be done in as short a time as possible. Accordingly, the oxy-acetylene cutting blowpipe was used.

To begin the cut, it was necessary to pierce a hole in the face of the drum. Each of the sixteen sections then required 6½ ft. of cutting through 2-in. gray cast iron. The work was readily handled in about 1½ hr. for each cut. As soon as the cutting was completed, the winch was ready for service.

Zonal Distribution of Gold, Silver, Lead, and Copper Ores in Idaho

By Francis A. Thomson and Fritz McGonigle
Dean School of Mines and Senior Mining Student, Respectively, University of Idaho

IN RECENT YEARS there has been a growing tendency to emphasize the relationship between metalliferous deposits and acid intrusives, particularly those of the granite batholith type. There has also been recognized in any number of instances a zonal arrangement of different types of ores about specific granitic intrusions. Spurr,[1] to whom we owe the first enunciation of this exceedingly important generalization and the theory supporting it, has had the satisfaction of seeing general acceptance of his ideas in the face of early hostility to them. In numerous writings covering the last eighteen years he has adduced numerous instances in support of the hypothesis of zonal arrangement, all showing positive and sequential deposition, all related to igneous intrusions. Sales[2] has pointed out an arrangement of this sort at Butte, where there is a graduation from copper ores at the center, through copper and zinc-manganese ores in the intermediate zone, to manganese-zinc-silver ores at the periphery, and Lindgren[3] indicates a rather definite zonal relationship at Tintic, with "gold and copper . . . near the monzonite, lead and silver mainly farther away." Emmons[4] has recently emphasized the general granitic association in an article of world-wide sweep, and Thomson[5] has postulated a similar origin for all the ore deposits of the State of Idaho.

It is not necessarily true, of course, that the arrangement at the present surface—which is after all a very transitory horizon—will bear any positive relationship to a fundamental zonation probably controlled mainly by temperature; but over a large area containing a great many different types of metallization these discrepancies will tend to disappear. We may, therefore, reasonably expect that there will be in general an areal zonation about the larger igneous intrusions. This theory we have attempted to test out for the State of Idaho.

In Idaho there are two main granite masses; the first is the Idaho batholith, which occupies the greater part of central Idaho; the other is the southern lobe of the Nelson batholith of British Columbia. In age relations, lithology, dikes, and complementary rocks they appear to be not dissimilar. Whether the Boulder batholith of Montana, the Nelson batholith of British Columbia, and the Central batholith of Idaho are definitely related is not known. One is inclined to suspect it, however. The exposure of the Nelson batholith appears to be fairly continuous, whereas the Idaho batholith outcrops more or less sporadically in cupolas and in canyons. Roof pendants are frequent and frequently mineralized.

In order to shed further light on a suspected zonation about granite outcrops, the writers recently undertook the preparation of the accompanying map in which the mining districts of Idaho, classified by their predominant metal production, have been compared as to their distances from known granitic areas.

On compiling the data for the gold district, we get the following table:

Gold

No. of Districts	Distance From Intrusive, Miles Within	District—Miles
5	0	0
5	1	5
40	2	80
1	3	3
2	4	8
1	5	5
1	7	7
1	9	9
1	10	10
5	15	75
62		202

202 ÷ 62 = 3.3 average distance.

The average distance of gold districts from granite outcrops is 3.3 miles, and fifty-one out of sixty-two districts lie within this distance; furthermore, ten of the districts lie practically within the granite itself, and almost without exception the great placer fields have all been within the granite areas.

A similar compilation of the silver districts and their distances from granite outcrops shows the following results:

Silver

No. of Districts	Distance From Intrusive, Miles Within	District—Miles
1	0	0
3	1	3
1	3	3
3	6.5	19.5
2	8	16
1	13	13
1	18	18
1	22	22
13		94.5

94.5 ÷ 13 = 7.2 miles, average distance.

The average distance of silver districts from granite outcrops is 7.2 miles, and ten out of thirteen districts lie practically within this distance.

Lead districts come next in order, and although a wider range of distance is evident, the weighted average is still significant:

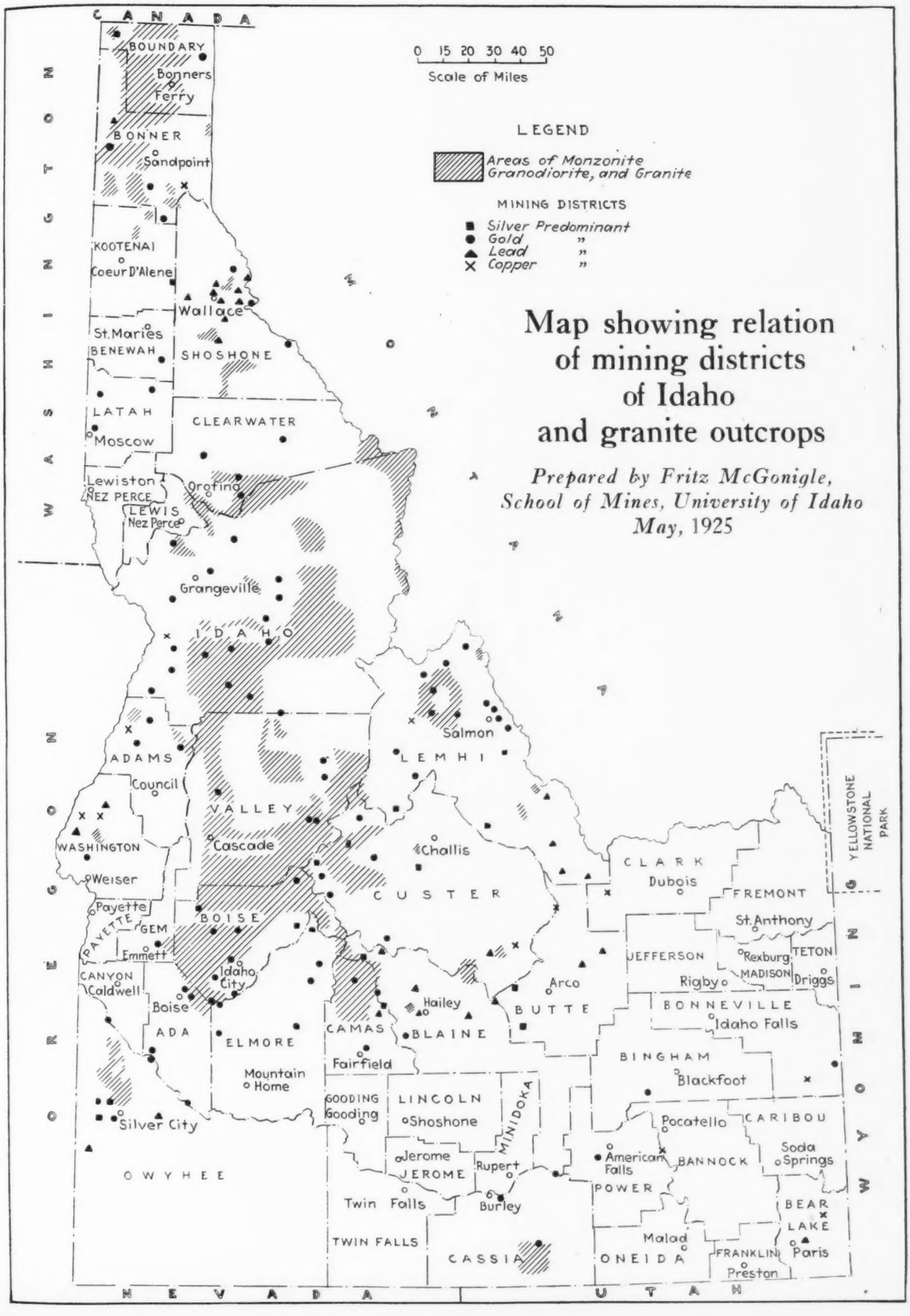
Lead

No. of Districts	Distance From Intrusive, Miles	District—Miles
2	1	2
4	3	12
13	7.5	97.5
1	9	9
2	11	22
1	14	14
1	15	15
1	17	17
1	20	20
1	24	24
1	32	32
28		264.5

264.5 ÷ 28 = 9.7 miles, average distance.

The average distance of lead districts from granite outcrops is 9.7 miles, and out of twenty-eight districts twenty lie within this figure.

[1] "Economic Geology," Vol. II, p. 781 (1907). See also "The Ore Magmas," pp. 253-291, and editorial, *Mining Journal-Press*, March 8, 1924, p. 393.
[2] *Trans.*, A.I.M.E., Vol. 46, pp. 80-81 (1914).
[3] "Economic Geology," Vol. X, pp. 228-229 (1915).
[4] "Geology of Prospecting," *Mining Journal-Press*, Jan. 29, 1923, p. 122.
[5] "Gold Veins of Sundry Areas in the Idaho Batholith," *Mining Journal-Press*, Oct. 4, 1924, p. 533.



Map showing relation of mining districts of Idaho and granite outcrops

Prepared by Fritz McGonigle, School of Mines, University of Idaho May, 1925

Finally, we come to the copper districts, which show the following distribution:

Copper

No. of Districts	Distance From Intrusive, Miles	District—Miles
1	3	3
2	4	8
1	5	5
1	10	10
1	13	13
1	16	16
1	36	36
1	41	41
9		132

132 ÷ 9 = 14.7 miles, average distance.

The average distance of copper districts from granite outcrops is 14.7 miles, and out of nine districts, six lie within this average figure.

Summarizing the foregoing tables, we have:

Metal	No. of Districts	Avg. Distance From Granite	No. of Districts Within Av. Distance
Gold	62	3.3	51
Silver	13	7.2	10
Lead	28	9.7	20
Copper	9	14.7	6

Certain limitations are of course recognized as to the final significance of these figures. It is possible, for example, that granitic rocks may be near at hand beneath the surface, at points far from known outcrops; furthermore, it is highly probable that there are granite outcrops of which the writers have no record. It is recognized also that certain serious discrepancies appear in the tables given, and it is known that in some districts there are apparent anomalies; gold veins, for example, occurring within a few hundred feet of lead veins. The number of copper and perhaps of silver districts may be too small to justify generalizations, and this may account for the lead districts being nearer to the granite than the copper districts. There are also, no doubt, dikes, sills, and perhaps laccoliths related to the batholith which should be perhaps given consideration. In spite of all these reservations, however, the grouping is highly significant and seems to preclude any explanation based upon mere coincidence.

Caracoles Tin Co.'s Aerial Tramway

The highest aërial tramway in the world, having a total length of more than five miles, is in use by the Caracoles Tin Co., Bolivia, for transporting ore from the workings to the mill. The mine is located on the upper eastern slope of the Andes Mountains near the headwaters of the Amazon River, at an altitude varying from 15,000 to 17,000 ft. above sea level; the mill is in the valley below, at an altitude of between 11,000 and 12,000 ft.

Due to the prohibitive expense of road building, it was decided to build an aërial tramway that would follow a more or less direct line from the mine to the mill, a practice adopted by many mining companies where road transportation is not feasible. The tramway started operating about a year ago. On its way from the mine to the mill it crosses mountains and valleys, the greatest altitude reached being approximately 16,000 ft.

Two cables, suspended from steel towers, are used, one stationary over which the buckets move, and the other moving, for controlling the movement of the buckets. The tramway is broken up into two sections, both operated from a transfer station located where the two meet. Buckets travel at intervals of about 1,000 ft. apart and are moved down, after starting, by the weight of the ore they contain. Empties are returned on the same continuous cable, moved by the weight of the down-going buckets.

The cableway is controlled from the transfer station. General Electric equipment is used for this purpose, a 35-hp., 900-r.p.m., slip-ring, back-geared induction motor being utilized for starting. After starting, the motor floats on the line and acts as a brake on the regenerative braking principle, to prevent excessive speeds. A solenoid load brake is also used for emergency stopping.

The cableway is also utilized for transporting supplies from the mill to the mine, when the motor is called upon to furnish power for the drive.

The mine itself is not electrified, the veins being too small to allow room for such equipment, although electric lights are used in some of the main tunnels. Motor-driven air compressors supply compressed air for drills in the mine, and the prime movers that furnish power to the mill and mine are hydro-electric. The air compressor motors and the generating equipment is all of General Electric manufacture, with the exception of one French generator.

New Plant for Making Acid From Zinc Concentrates at Broken Hill

The sulphuric acid plant of the Broken Hill Proprietary Co., Ltd., in New South Wales, produced equal to 2,249 long tons of strong sulphuric acid for the year. This plant has been leased to the Barrier Roaster Co., which has erected an adjoining roasting plant consisting of three De Spirlet roasting furnaces, for the calcining of zinc concentrates, the sulphur dioxide that is driven off being used in the manufacture of sulphuric acid. In addition to the roasters, a plant was erected to dry the concentrates before they are admitted to the roasting furnaces. The zinc concentrates as received at this plant contain from 3 to 5 per cent of moisture, and are elevated to a hopper at the rate of approximately eight tons per hour. The material is fed at a regular rate to a Rigg-MacBride drier, which is a revolving trommel completely incased in a substantial plate housing. The trommel itself consists of two $\frac{3}{16}$-in. mesh screens one within the other. Lying in the space between are a number of small marbles. Air, heated to approximately 500 deg. C. by passing through a small oil-fired furnace, is drawn through the drier by the operation of a suction fan working to a 3-in. water gage. The dried material is delivered from the bottom of the drier to an 18-in. conveyor and then to the roaster bins. The moisture, with some dust, passes from the top of the drier through a 15-in. pipe to a cyclone dust collector, where the moisture goes to the atmosphere and the fine dust is sent to the roaster bins. The moisture in the concentrates is reduced to 0.2 per cent at the end of the operation.

A small plant has also been erected to deal with the zinc concentrates purchased at Broken Hill by the Electrolytic Zinc Co. of Australasia. The purpose of the plant is to mix and grade the zinc concentrates received from the various supplying companies in such a manner as will render the material more suitable for roasting operations at the Port Pirie, Wallaroo, and other plants in connection with the production of calcines for the Risdon works.

Useful Operating Ideas

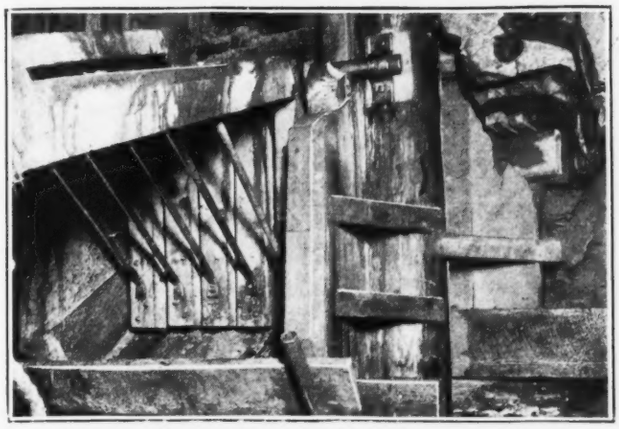


Fig. 1—Finger chute used on No. 7-8-9 levels

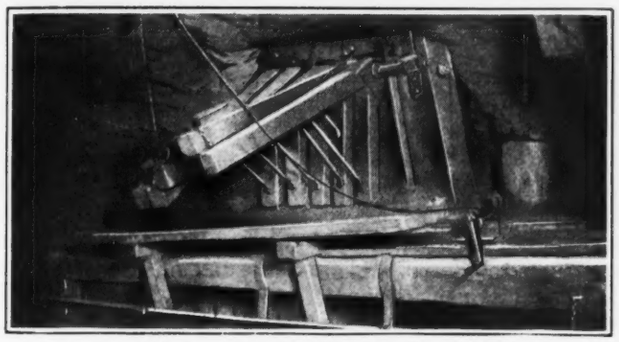


Fig. 3—Finger control chute gate on No. 8 level

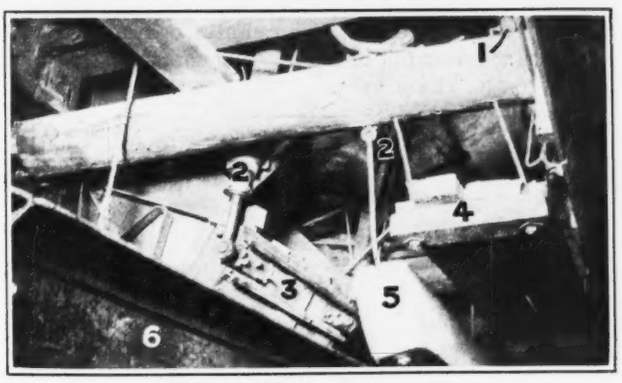


Fig. 4—Main chute gates

1. Fourway valve. 2. Air cylinders. 3. Arc gate. 4. Operator's platform. 5. Baffle to prevent spills. 6. Ore car.

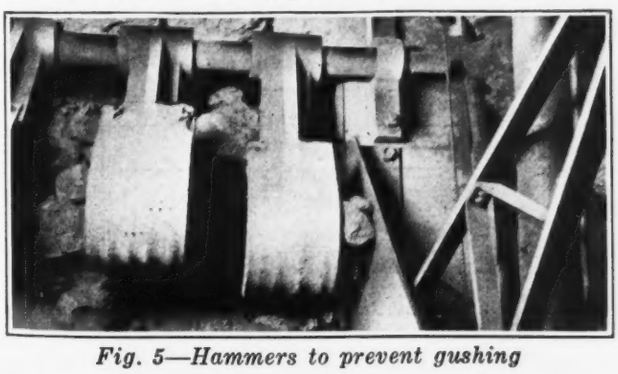


Fig. 5—Hammers to prevent gushing

Construction of Ore Transfer Raise of Engels Copper Mining Co.

By W. R. Lindsay
Engelmine, Calif.

The new ore transfer raise at the Engels mine of the Engels Copper Mining Co., at Engelmine, Calif., connects the adit level (No. 10) with No. 7, 8, and 9 levels and delivers to two loading chutes at the adit level. The raise is 8x8 ft. in section and is parallel with a two-compartment manway raise, which is provided with a manway and cage compartments. The latter is separated from the raise by a 20-ft. pillar.

The ore at the Engels mine breaks large and is difficult to reduce to smaller size by sledging. In designing the details of the transfer raise, the primary condition of handling the ore in as large pieces as are received from the shrinkage stopes was adhered to in determining the dimensions of chutes and grizzlies. In operating the upper levels when hoisting was practiced, the grizzly spacing was 11 in. The grizzly bars wore in service so that pieces from 12 to 12½ in. would pass. The grizzlies used on the transfer raise, shown in the generalized sketch, Fig. 2, are provided with bars spaced from 14 to 15 in. apart. Flat pieces of ore weighing from 1,000 to 1,200 lb. will occasionally pass the grizzly. Finger chutes, designed after Alaska - Treadwell practice, are used on the stopes on the Nos. 7, 8, 9, and 10 levels. The chutes on Nos. 7, 8, and 9 levels are smaller than the chutes on No. 10 level, as 1-ton cars are used on the upper levels, and 6-ton cars on No. 10 level. Fig. 1 shows the smaller chute gate. The larger chute is similar in general design but is placed higher. The ore transfer raise is offset at each intermediate level and a finger bar gate put in to control the ore flow. Each intermediate level is also provided with a grizzly. The control gate is shown in Fig. 3. Short drifts at intervals of 40 to 60

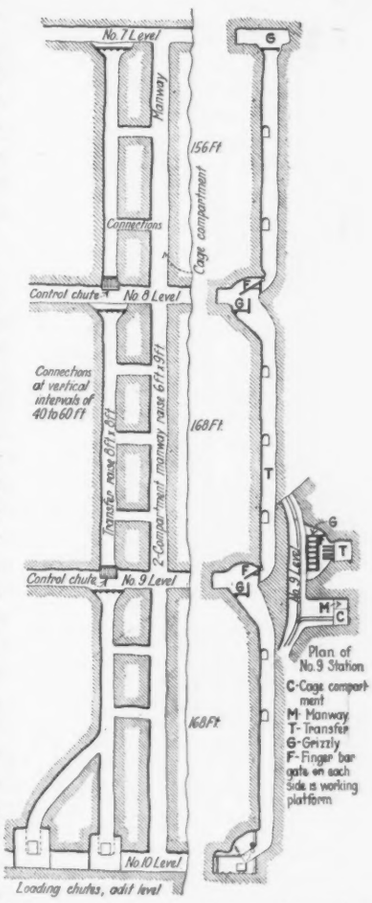


Fig. 2—Layout of ore transfer and manway raise

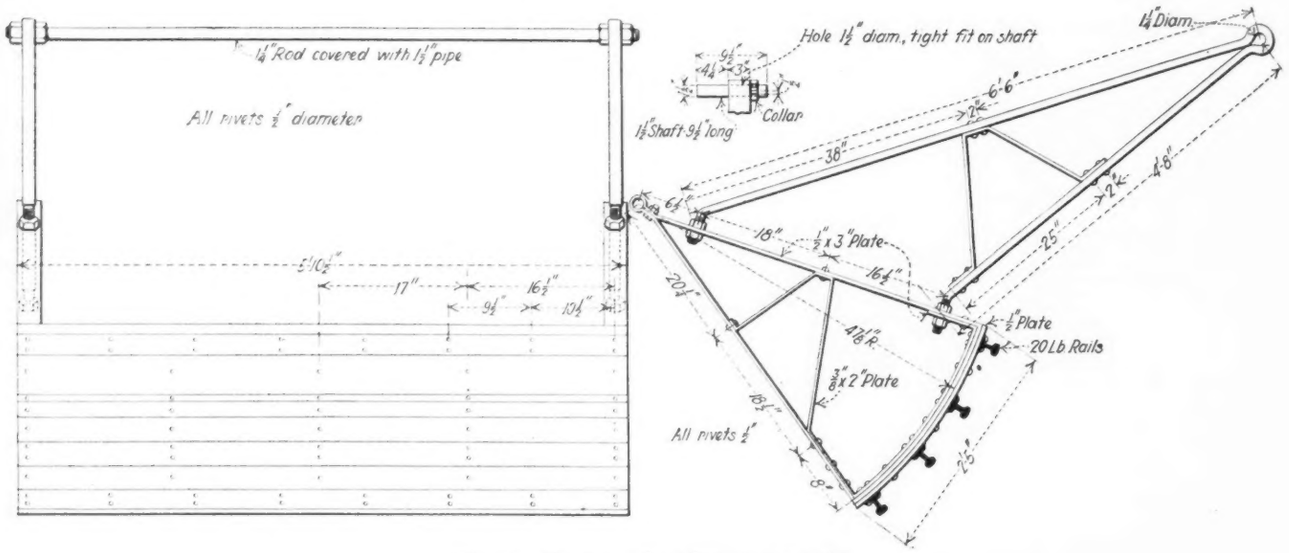


Fig. 6—Design of underswung gate

ft. connect the manway raise with the ore transfer. These were used in driving the raise, which was done on stulls. They also serve for reopening the raise in the event of a hang-up. The manway provides a ladderway raise and a cage compartment. The hoist is at the bottom, the hoisting rope passing up the manway and over a sheave to the cage compartment at the top of the raise.

On the adit level, two loading chutes are at the foot of the ore transfer. As the ground in the vicinity of the loading chutes was loose, a reinforced concrete wall, 1 ft. in thickness, was first built with the necessary openings for the gate plates. Each chute is built of sheet steel with special manganese steel liners (Fig. 7). The chute gates, of the underswung arc type, were handled by man power, but later two compressed-air cylinders were placed on each gate. The cylinders are constructed of 5-in. extra heavy pipe and both are controlled by one four-way valve. The gates and accessories are shown in Figs. 4 and 5 and the chute detail in Figs. 6 and 7. To prevent gushing three heavy cast-iron hammers, each weighing 700 lb., are hung in the chute above the gate. The use of this method of checking the flow enables a larger chute opening to be used, and this affords sufficient room for barring down large chunks of ore. It was found that the cast-iron hammers were easily broken by blasting at the chute mouth, but this difficulty was overcome by jacketing the weights, as shown in Fig. 5, with a piece of worn roll shell. The chutes operate smoothly and with a minimum of labor. A loading staging gives access to the chute gate.

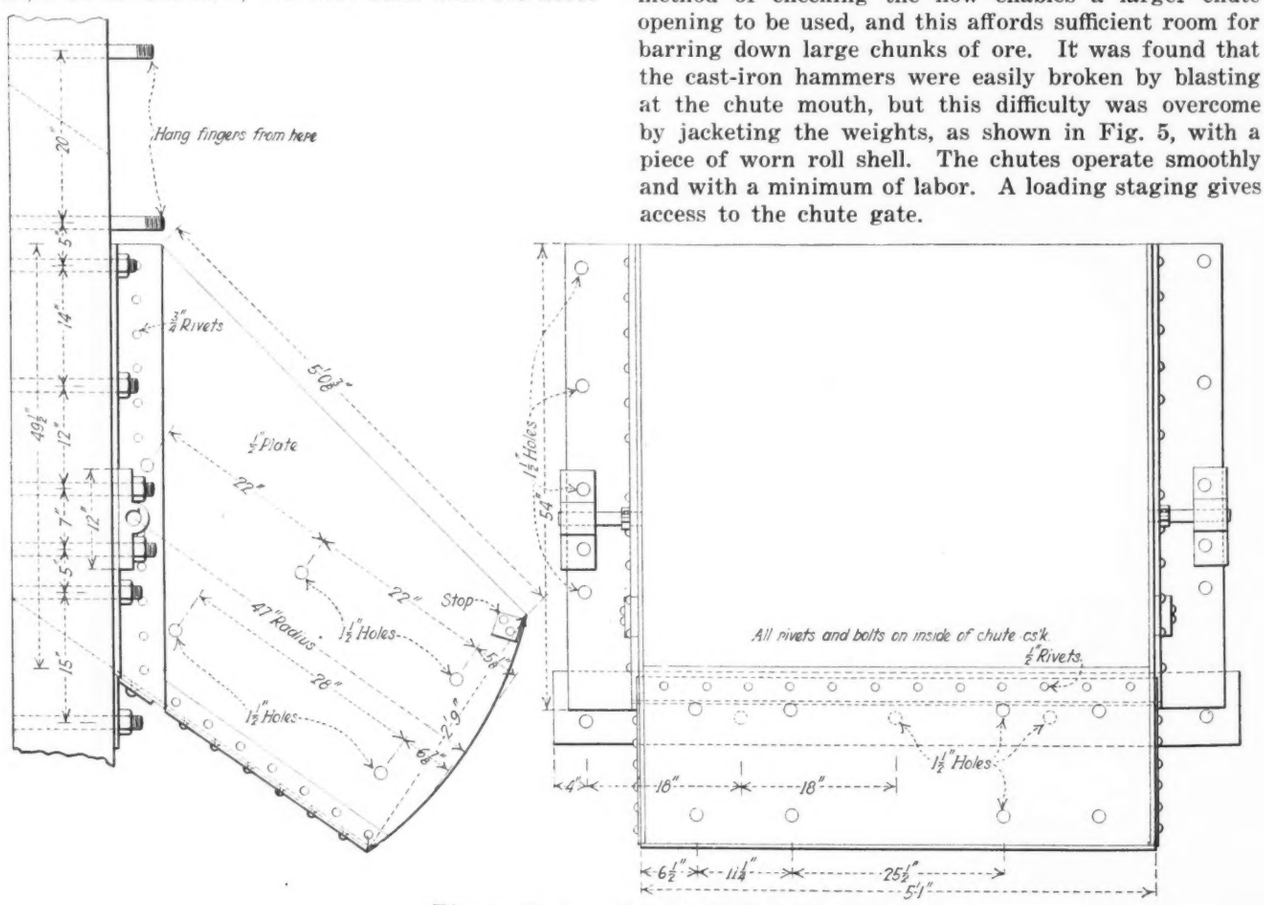


Fig. 7—Design of steel chute mouth

Discussion

"Engineering and Mining Journal-Press" is not responsible for statements or opinions published under "Discussion." In many cases the views expressed are diametrically opposed to editorial policy and belief.

Increments in Darkest Africa

THE EDITOR:

Sir—I was much interested in your editorial in the issue of April 11 discussing the financial stresses of the central African mining enterprises in general and of the Tanganyika concessions in particular. In closing, you remark: "Plainly, rich and extensive though the mineral deposits in central Africa may be, those who in the end will profit by their development will have paid the price and merited the increment."

No one but a communist will object to an "increment," but shall it be controlled by rational social principles or just be any old thing? Ought it to be in proportion to services rendered to production, or must it always be merely a matter of luck? In most industrial undertakings the law of competition dominates and automatically adjusts rewards to merits; but in mining we often have the mineral deposit as the principal factor in production and an "invesment" made by Nature giving to its possessors an advantage over competitors which is quite independent of any human contribution in the form of either labor or its savings in the form of capital.

In the case of Tanganyika Concessions we have an unusual situation. Although the company owns perhaps the richest and greatest group of copper lenses ever found, it has been handicapped by its location in the center of a tropical wilderness 1,200 miles from the nearest seaport. The company is entitled to little reward as a discoverer, for its copper belt had been worked by the natives from ancient times and I remember in the perusal of Stanley's "Through the Dark Continent" forty years ago a mention of the famous copper mines of Katanga. Once a few orebodies of the large outcrop type are found in a new zone, the discovery of the remainder is merely a question of time, patience and a knowledge of prospecting. I became convinced of this fact some years ago as the result of a season of exploration of the iron ores at the east end of the island of Santo Domingo.

The chief social merit of Tanganyika investors consists in their boldness in pouring millions into such a remote locality with the resolution to wait for decades, if need be, before harvesting any commensurate reward. Yet this merit is not unprecedented, as the same feat was performed recently, with somewhat quicker results, by the organizers of the Cerro de Pasco company in Peru; nor does it match the boldness of many mining explorations where, unlike Katanga, the extent of the rich orebodies is entirely unknown at the start. The latter case is much more risky, in the present crudity of economic geology, than was the African whose wonderful copper bonanzas required for successful exploitation simply the correct application of such conventional works as railways, power plants, and smelters. In truth, the Katanga lenses for many years past have been "manufacturing propositions" rather than the forlorn hopes of the ordinary unproductive district.

Since the investors in Tanganyika Concessions have thus been only partly responsible for its present productivity, we must inquire, Who else have been factors in the result? As direct partners the investors have had only two groups, employees and government. The small class of imported white employees is evidently well able to look out for itself, as it can be coaxed into Darkest Africa only by multitudinous baits varying from high salaries to frequent movies. The same remark applies with much less force to the bulk of the employees, who are native negroes; but as long as their engagements are voluntary rather than obligatory (either directly by indenture or indirectly by the hut tax or exclusion from their village lands), their share in profits may be better given in the form of free welfare institutions like schools, hospitals, asylums, libraries, parks, etc., than by any obligatory division with them of profits as is prescribed by Art. 123 of the existing Mexican Constitution. And my subsequent proposal would furnish the local government with ample funds for supporting such expensive aids to social comfort and progress.

In considering the remaining partner, "government," in Tanganyika, we have a different problem from that of the employees. Omitting the home governments of the company and of individual investors, which will try, and perhaps succeed, in securing their due pounds of flesh by income taxes, we have as the most important factor in production the government of the Congo Free State, where the mines are located. I dub it advisedly thus, because without police protection it would have been impossible for Tanganyika investors to have had any of the three things on which the present market value of their shares depends—viz., first, the exclusive possession of their orebodies; second, the physical force for maintaining order among their employees; and third, a safe road through savage Africa for the transportation of their copper to Europe. If any investor doubts this, let him consult the owners of many American companies in Mexico who, during the anarchy of the decade of revolution, found all mineral production impossible.

Perhaps the most practical plan for dividing justly the expected great increments of Tanganyika between investors and the government is the "excess profits" tax based on the royalty value of the extracted ore rather than on the total earnings, as was the case of the defunct United States tax of this type. Under this plan, the company would pay no taxes whatever, not even import duties, until it had become productive enough to satisfy all current and deferred dividends on its investment of true capital at some moderate rate, as 6 or 8 per cent annually. To balance this preliminary tax exemption, which would by so much lessen the cash investment necessary for beginning production, the excess profits tax when applied would be rather the

share of a partner than the usual tax levy and should be 50 per cent or more of the net royalty value of the ore. Of course, in the estimate of "net royalty" due provision should be made for the amortization of true or economic capital (which does not include orebodies that are technically "land") as well as depreciation and insurance of plant during the probable life of the mines. The basis of the levy would thus be the exact opposite of the existing United States income tax, under which the returns from true capital are taxed and the royalty value of ore exempted in the item of "depletion."

In my humble opinion, this direct participation of the government in the royalty value of Tanganyika ore would render the increment remaining for the investors morally justifiable as a premium, above the market rate of interest, given as a reward for the risk and skill exhibited by the development of such an enterprise. By some this might be called "socialism," but it would be a misnomer, for this technical term properly applies only to the Marxian system, which negates *all* private rights of property in the instruments of production. The drawing of the public income exclusively from the unimproved value of natural resources is the only scheme in harmony with the existing political organization of society, which founds a state on its possession of a fixed territory rather than on its control of persons, as among the Aztecs. My plan aims at a rational instead of a traditional system of public finance inherited from past epochs when society was governed on a feudal basis. ROBERT B. BRINSMADE.

Mexico City.

A Limit to Generosity

THE EDITOR:

Sir—In your issue of July 4, 1925, appeared a notice of the publication of an article on mining terms contained in "Mining in California" for January, 1925, and stating that it could be obtained upon request at this office. Since the notice appeared, the bureau has received requests at the rate of five to ten per day from Canada, Mexico, and the various parts of the United States. This convinces us as to the effectiveness of advertising in your magazine, but in the future we shall request that it be stated that "Mining in California" is on sale at 25c. per copy. LLOYD L. ROOT,

San Francisco. State Mineralogist.

Use of High- and Low-Grade Cyanide

THE EDITOR:

Sir—Some time ago I mentioned in *Mining Journal-Press* that in the treatment of our relatively high-grade silver ores, where large amounts of cyanide are necessary, the exclusive use of black cyanide gave rise to some difficulty with respect to rapidity of extraction and effective precipitation. I suggested that the use of black cyanide should be alternated with the use of white cyanide at periods of a month or six weeks. During the last six months we have run a test on 45,000 tons of ore, and we have found that the best results are obtained when a mixture of white and black cyanides is employed concurrently. It seems that the trouble formerly experienced arose when the dissolved salts reached a certain concentration. By keeping below this concentration we enjoy the benefits of the lower cost of black cyanide and of its lime content. The alternate use of black and white cyanide is not so satisfactory as their concurrent use, both from the point of view of precipitation and, more especially, of the consumption of lime per ton milled. PAUL T. BRUHL.

Rosario, Honduras.

Ward Determination Method

THE EDITOR:

Sir—My short method of meridian and latitude determination as published in the May 16 issue of *Mining Journal-Press*, it appears, is not so useful or universal as I had hoped. Although approved in theory by a government survey department and otherwise tested, I have been advised that it is accurate for meridian determination only for hour angles of 6 or 18 hours, and for latitude only for 0 or 12 hour angles. I regret that its limited application should have been discovered after and not before publication.

Wharton, N. J. HOWARD R. WARD.

Consultation

Tungsten Ore Consumption

"Can you give me approximate figures for the United States and world consumption of tungsten ore?"

Normal United States consumption of tungsten ores (60 per cent tungsten trioxide) is, according to latest estimates, about 4,000 tons yearly, though during the World War it was from two to four times this amount. World consumption of tungsten ore has been calculated at not to exceed 15,000 tons a year, but the actual figure is probably nearer 13,000, inasmuch as the total world production for the four years 1920-1923 averaged only 9,000 or 10,000 tons per year and stocks in the United States at the beginning of 1923 were about 12,000 tons, dwindling since to a low figure.

The present duty on tungsten ore is 45c. per pound of contained tungsten, equivalent to $7.14 per short ton unit of tungsten trioxide. The price is now $11.50@ $12 per unit, thus affording foreign producers about $4.50 per unit for production and delivery costs and profit. Production costs in southeastern China are very low, and concentrates from that part of the world can be delivered at American ports at from $2 to $3 per unit. Costs in the United States are much higher and even at $12 per unit no large production is likely to be stimulated, though the California and Colorado deposits are of high grade, containing scheelite and ferberite.

Graphitic Gold Ores

"Can you give me the names of companies that have had difficulties in the treatment of graphitic gold ores by cyanidation? I may be able to do something for them in the line of a cheap roast."

The only American company that has had much trouble recently from this cause, so far as we know, is the McIntyre Porcupine Mines, Ltd., Schumacher, Ont. The problem was solved there by adding a little oil to the ball mills, the oil serving the purpose of coating the graphite particles so that they do not cause precipitation of the gold at the wrong time. Similar trouble has been experienced by the Ashanti Goldfields Corporation, Ltd., on the West Coast of Africa, whose head office is at 6 Southampton St., Holborn, London, W.C. 1, England; and in Korea by the Chosen Syndicate, Taiyudong, Korea, and by the Oriental Consolidated Mining Co., whose head office is at 15 Broad St., New York City.

News of the Week

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Summary

A PRELIMINARY SURVEY of the activities of the Bureau of Mines and Bureau of Standards reveals no duplication of work. The special committee continues its work of co-ordination.

Mining industry at Fairbanks becoming stabilized and a permanent industry is expected.

Enforcement of "blue-sky" laws in Idaho, to safeguard public stressed by State Mine Inspector Campbell.

Argonaut, Kennedy, and Plymouth mines apply for reduced valuations. California Board of Supervisors denies request.

Miner loses personal injury suit by reason of failure to use safety devices provided by United Verde Copper Co.

Ray Consolidated Copper Co. provides buses for school children; each bus is accompanied by one or more teachers.

Cheap electric power to be supplied Salt River Valley, Arizona, in co-operation with Inspiration Copper. Improvements to cost $410,000; 10,000 hp. to be developed.

Henry Ford acquires lease option on Marquette iron lands. Heretofore he has considered fee lands only.

Important zinc discovery reported near Larchwood. Options have been placed on 10,000 acres.

Failure of tailing dam, weakened by July earthquake, at Neihart, Mont.

Hydro-Electric Plant to Be Constructed at Mormon Flats

The Salt River Valley Water Users Association of Arizona is to invest $410,000 in the construction of a 10,000-hp. hydro-electric plant at the base of the Mormon Flats dam and in the extension of its 100,000-volt transmission line from Goldfield to Mesa. The Central Arizona Light & Power Co. will spend $200,000 for equipment to handle the newly developed power, which will be delivered to it under a contract with the association. Due to the intermittent character of the flow of water through the Mormon Flats dam, it would not have been practicable to build the plant were it not for the contract that obtains between the water users' association and the Inspiration Copper Co. Under the terms of this contract, when power is not available from Mormon Flats, steam power may be purchased from the copper company.

The projected plant will produce 43,000,000 kw.-hr. of electrical energy per year, with a market value of $350,000. The funds for the construction of the new plant will be advanced by the Central Arizona Light & Power Co. and will be repaid by the association with interest at 6 per cent in twenty-five years. The annual payments will amount to $31,869, or a little more than half the minimum of the company's annual power purchases under the contract. The power will be delivered at an energy and demand charge of 8½ mills per kilowatt-hour. It will be possible for the power company to furnish 25-cycle high-voltage power to ice plants, bakeries and other industries at a much lower rate than has heretofore prevailed. The projected construction is expected to be complete by April 1, 1926, ten months ahead of that at the 40,000-hp. plant at Horse Mesa. It will increase the power revenue of the water users' association between $150,000 and $200,000 annually.

Henry Ford Options Iron Ore Lands

Henry Ford has procured from the Palms-Book Land Co., of Detroit, a lease option on 2,200 acres of land on the Marquette range, Michigan. The drilling already done on the land has disclosed a body of merchantable ore, but the Ford company desires to check the previous drilling and test out more of the formation. The ore is a soft hematite and is close to the footwall. It is believed that ore of harder structure will be found close to the hanging wall.

Ford has done considerable drilling on his own lands, but to date has disclosed very little ore. His policy since entering the iron-mining business has been not to accept any lands under option or lease, and this is the first departure from that policy. At present Ford operates one iron mine, the Imperial, at Michigammee, on the Marquette range, which will produce 275,000 tons of limonite ore this year. Other ores going to the River Rouge furnaces at Detroit are being supplied by the Cleveland-Cliffs Iron Co., Oglebay, Norton & Co., and C. K. Quinn & Co. The total ore that Ford will use this year will be between 500,000 and 600,000 tons.

Reduced Valuations for Argonaut, Kennedy, and Plymouth Mines Denied

The applications of the Argonaut Mining Co., the Plymouth Consolidated mine, and the Kennedy Mining & Milling Co. for reduction of their assessed valuations were denied recently by the members of the Board of Supervisors of Amador County, California, sitting as a board of equalization.

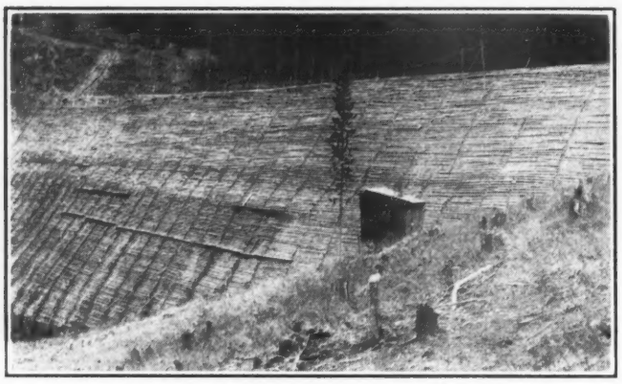
H. J. Sheafe, representing the Argonaut Mining Co. and the Plymouth Consolidated mine, asked for a reduction from $521,470 to an amount not in excess of $350,000 for the Argonaut, and from $265,030 to $100,000 for the Plymouth Consolidated. The petition stated that the Argonaut mine has not produced a net profit during the last five years of operation. It is set forth that the production for that period was $2,529,129.75 and the costs $2,598,944.46, with a resultant loss of $69,814.71.

Regarding the assessment of the Plymouth Consolidated, it was stated that on March 1, 1925, the mine was placed in the hands of a receiver and was offered for sale in the open market, and that the Argonaut Mining Co. purchased the property for less than $75,000.

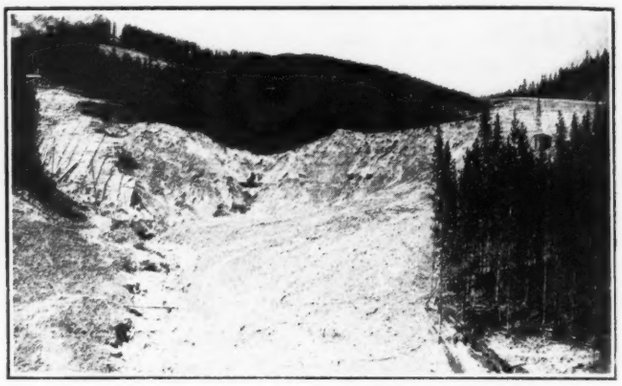
Webb Smith, representing the Kennedy Mining & Milling Co., asked that the assessed valuation of the Kennedy mine be reduced from $250,000 to $150,000. In the petition it was stated that the Kennedy mine has not produced a net profit during the last six years of operation. There seems to be a very wide difference of opinion as to the real taxable value of these mines.

Novel Tailing Dam Succumbs to Earthquake

When one of the editors of *Mining Journal-Press* was in Neihart, Mont., last fall, he was much impressed with a tailing dam built by the Silver Dyke Mining Co. in a coulee on the side of a mountain, near the concentrating plant. He thought of the damage that might be done to the dwelling houses a short distance below the dam, should it ever give way. Of this there seemed little likelihood, however, and probably nothing but an earthquake would have brought this catastrophe about. This is exactly what happened a little after 10 o'clock at night on July 10, with the result shown in the accompanying photograph. For comparison, a view of the dam as it existed last fall is also shown.



Silver Dyke tailing dam before breaking



Silver Dyke tailing dam after failure

Several houses in the valley below the dam were inundated by the flood of tailings and are a total loss, as were also a storeroom and pump station belonging to the mine. Two children, aged 4 and 7, lost their lives.

The dam was about 90 ft. high and between 200 and 300 ft. long. It was composed of pine trees laid end to end, as shown in the photograph. About every 10 ft. along the face of the dam and between the trees were fastened smaller trees at right angles to the face of the dam and projecting, with their branches on, into the tailing pond. This made a good anchor for the dam, and had not the earthquake tremors loosened the structure it is unlikely that any trouble would ever have occurred. One might have thought that the vast deposit of tailing would have been so densely packed that there would be little tendency for the whole to flow down the valley, the water being only a few inches deep on the surface, but evidently a good portion of it migrated.

Enforcement of Blue-Sky Laws in Idaho

State Mine Inspector Defendant in Damage Suit by Idaho Copper Corporation

Stewart Campbell, Idaho State mine inspector, has just completed his annual inspection of mining conditions in the Coeur d'Alene district. Mr. Campbell has been made defendant in a damage suit brought by the Idaho Copper Corporation, based upon his exposure of the methods of that company which resulted in its being dropped from the Boston Curb Exchange. Discussing the condition of the mining industry in Idaho, Mr. Campbell pointed out that this year had demonstrated that something more than high metal prices and demand for lead mines are necessary to attract capital for the development of new mines. These have prevailed and the productive mines are prosperous, but the amount of money going into new mining enterprises this year has been disappointing. For explanation of the cause, Mr. Campbell said:

"Close observation over a period of five years has led to two conclusions—namely, too much restrictive legislation, particularly in the Eastern states, to which Western development must look for funds; and, second, the investing public is suffering a loss of confidence in mining investments. Nothing can be done to prevent 'blue-sky' craze, as much of it was inspired by frauds and swindles that were perpetrated on the investor through quiescence in the home state of the organization, but much good can and will revert to Idaho mining if the investing public knows that Idaho is using every precaution and is particularly vigilant in preventing any shady mining promotions, and that this position is receiving the cooperation and support of everyone interested in mining. The latter conditions are true at the present time, but they are not sufficiently known to the investing public.

Tailing dam construction

Federal Installs Experimental Tailing Mill

The Federal Mining & Smelting Co. is building an experimental tailing mill at its Lucky Bill property, in the Oklahoma section of the Joplin-Miami mining field. It has five flotation machines at the Lucky Bill. The Federal will drill some line holes with the Huttig Lead & Zinc Co. in an effort to pick up a run of ore that has been developed on the Huttig and Cosmos properties. The Jeff City Mining Co. is sinking a shaft to tap a shallow run of ore it has located on the southeast corner of the Cosmos lease.

The Commercial Metals Mining Co. is operating a mine on the Renzenhausen land, about six miles southwest of Joplin. The formation is unusual in that the ore is found below the Grand Falls chert. This mine was opened several years ago, but did not pay. The present owners have built a small mill and are turning out concentrates steadily.

A lease on the A. W. C. mine, a mile west of Joplin, has been taken by the Cherokee Lead & Zinc Co., and a pumping plant has been installed on the 175-ft. level. The property formerly was a steady producer of sheet ground zinc ore. About four miles west of Joplin the Kansas Explorations Co. expects to have another new mill on the Robinson lease ready for operation by Sept. 1.

Aluminum Co. Plans to Spend $70,000,000 on Plant in Canada

The Aluminum Co. of America will spend $70,000,000 on a model city near Quebec, as headquarters for its contemplated Canadian plant, according to Aimee Geoffrion, a Montreal lawyer, who has been acting for Quebec in negotiations. The city will house at least 40,000 persons.

The plant will utilize water power from the Saguenay River, and when completed will be the second place on this continent where bauxite is reduced to aluminum. The other plant is at East St. Louis. At least fifteen steamers will be employed to bring the bauxite from the extensive deposits on the Demerara in British Guiana. The electrical development will be done by the Chute A. Caron Co., a subsidiary company.

Miner Fails to Use Safety Device; Personal Injury Suit Lost

The personal injury suit of Pete Stepovich against the United Verde Copper Co. was dismissed by the court when the plaintiff admitted that he was familiar with the rule about wearing goggles when engaged in certain kinds of work and that he had been injured when ignoring this regulation. In his complaint Stepovich alleged that he had been injured by a splinter of rock striking him in the eye while he was working in the mine on Jan. 20, 1923, and that as a result of the injury he had suffered a partial loss of his eyesight. On cross-examination he admitted that he was perfectly familiar with the rule requiring employees to use goggles while engaged in such work and that the company had provided the same. The case is of interest as demonstrating that the failure of an employee to avail himself of the protection provided for his benefit is a complete answer to claims for injuries sustained by reason of the failure of the workman to make use of such protection.

Good Ore on 800-Ft. Level Midwest-Butte Dev. Co.

Midwest-Butte Development Co. announces the encountering of a body of commercial ore on the 800-ft. level of its workings in the western portion of the Butte district. This is a continuation of the ore found on the 300 and 500 levels. The picking up of this ore shoot warrants the company prosecuting a very heavy development program and it is said that additional equipment will be installed and deepening the "Prospector" shaft will commence in the near future.

The company was formed a number of years ago by A. M. Chisholm, of Duluth, and E. B. Schley, of Moore & Schley, New York. These gentlemen are associated with the Denn and Shattuck properties of Arizona and the Howe Sound Co. of British Columbia and Mexico. The company acquired ten claims, among them the Prospector, Silver Cleft, and Milwaukee, and under the management of John McBarron has sunk 1,400 ft. of shafts and opened 7,000 ft. of drifts and crosscuts, in all spending close to one million dollars.

Zinc Ore Discovered Near Larchwood, Sudbury District

An important discovery of zinc ore of good quality has been made near Larchwood, in the Sudbury district of northern Ontario, as the result of diamond drilling by the Sudbury Diamond Drilling Co., operating under contract with the Bunker Hill & Sullivan Mining & Concentrating Co., of Idaho. Zinc has been reported from this field occasionally during recent years, and for three years efforts have been made looking to a definite move for testing the field. The present operations have been in progress since July 15, with four drills working. Results from one drill at a depth of 800 ft. show a 100-ft. body of zinc of commercial quality. A fifth drill will shortly be put in operation and should the ore be proved to occur in quantity the establishment of extensive zinc-mining operations is assured. The first reports that the discovery was made in drilling for coal are incorrect, as the company had no such object in view. Officials are disposed to be reticent in view of previous reports of discoveries in this area which have proved disappointing. More than 10,000 acres of land has been placed under options representing about $1,000,000 in connection with these operations.

Betty O'Neal Mines

Development of the big north orebody in the Betty O'Neal mine, Battle Mountain, Nev., continues on two levels below No. 4 tunnel, with most gratifying results and with no diminution in values. W. L. Chapman, superintendent and engineer, estimates that an average of 20 oz. silver per ton can be maintained for a width of 25 ft. On both levels raises are being driven at intervals of 30 ft. from which stopes will be opened.

Two-thirds of the underground force is employed in development work and only two jackhammer drills are engaged in stoping. The mill is treating 70 tons per day. The output of the mill has paid for all the development work under way and created a large surplus fund. Ore reserves in the north ore column thirty days ago were estimated at 136,000 tons of 20-oz. ore, which is constantly being increased as the drifts are extended north. The flotation mill consists of two 125-ton units, and production can be increased whenever it is desirable.

Mica Shipments from North Hastings, Ont.

A large showing of mica has been discovered a short distance from Bancroft in North Hastings, Ont. Crystals weighing as much as two tons have been taken from the deposits by Sorser & Co., who recently shipped 120 tons to the American market. The company proposes shortly to erect a cutting factory for the purpose of cutting mica to size.

Recent Developments in Treasure Hill District

Plans are being made by the Argyle Mining Co., Eureka, Nev., to build a custom mill for the treatment of ore available on Treasure Hill, a producer of silver-lead sixty years ago. President A. F. Kreye of San Francisco, who visited the Eureka mine recently, reports that on the Mahogany claim 100 ft. of work has been done recently, all of which is in milling ore. The best showing is on the Pocatello claim, where high-grade ore shows in several places.

The Treasure Hill Mining & Milling Co., under the management of Ira B. Joralemon and H. T. Hamilton, has completed the second 400-ft. diamond drill hole to locate the faulted portions of the ore-bearing limestones so productive in the early days of Treasure Hill. Other drilling is being done.

North of the Bonanza mine Richard Lisle is preparing for development work on the property of the Myra Divide.

Canadian Geological Survey Mapping New Areas

In view of the important developments in the mining districts of Quebec, especially in the gold fields of the northwestern part of the province, arrangements have been completed between the federal and provincial governments by which geological surveys will be extensively carried out this year. Five parties will operate this summer in the Rouyn-Harricana district alone.

Two surveys will be made by the Geological Survey of Canada this summer, for the purpose of mapping mineral deposits in New Brunswick and compiling data and information with respect to the deposits found within the areas selected for this season's work. One of the areas selected for study this year is that in the vicinity of Lake George, where there are antimony deposits. The second survey will be conducted between Campbellton and Bathurst.

New Cyanide Plant, 100 Tons Capacity, at Douglass Mine

The Nevada Douglass Mines, Inc., purchaser of the old Douglass mine, twelve miles southwesterly from Mina, Nev., has placed orders for machinery and material to construct a new 100-ton cyanide plant on this property. A smaller mill has been in successful operation since March, and in a general way the same proved method of treatment will be used in the new plant.

Mine development has about reached the stage where company officials believe a daily tonnage of 200 tons can be maintained, and the 100-ton plant is planned as the first unit of a proposed 300-ton mill. Main ore reserves are in the large contact vein, in which orebodies up to 15 ft. in width have been blocked out, although the smaller veins contain an appreciable tonnage of good ore with favorable possibilities as development work progresses.

Black Hawk Cons. Levies Assessment and Installs Pumps

The Black Hawk Consolidated Mines Co. has published the list of delinquent stockholders who have not paid the last assessment of 3c. a share. With the publication of the list, announcement is made that the directors will be forced to offer this stock at a public sale if the assessment is not paid by Aug. 24.

The company is installing a larger pump on the 525-ft. level at Hanover Gulch. Heretofore the company has been able to hold the water only to the 325-ft. level, but assistance from the Ray Consolidated Copper Co., which is using this surplus water, has resulted in the lowering of the water.

Sneath & Clay Mine Reopened at Nevada City

The old Sneath & Clay mine, between Grass Valley and Nevada City, Calif., has been reopened by the Camborne and Hayle Mining Co. W. F. Gormley is president of the company. A new surface plant has been constructed and the cleaning out of the old shaft is in progress.

Increase in California Mineral Production

The value of the mine production of gold, silver, copper, lead, and zinc in California in 1924 amounted to $22,973,257, an increase of $1,844,312 over the 1923 figures, according to statistics compiled by James M. Hill, of the Bureau of Mines. The total production of these ores in California in 1924 is placed at 2,019,200 short tons, as compared with an output of 1,535,691 short tons in the year previous. The number of mineral producers reporting to the Bureau of Mines for the year 1924 was 533, which compares with a total of 621 producers reporting in 1923.

Shasta County Developments

The Mammoth Copper Co. has announced that its smelter at Kennett will be shut down on Aug. 10. At Winthrop, Adrian Joyce is operating the Bully Hill property, which is producing about 300 tons of ore, the zinc concentrates from which are being shipped to Belgian zinc smelters at the rate of eight carloads per week. A deed to the Afterthought properties has been conveyed by J. T. Milliken to Forest P. Trellis, of St. Louis, who is acting for the bondholders. The property is now held under lease by Adrian Joyce. The Mountain Copper Co. has ceased shipping copper ore from its Iron Mountain mine to the Kennett smelter and will store the ore pending resumption of smelting operations at its own plant at Martinez, Calif.

Salt Deposits in Texas

Salt beds in Texas are distributed over an area of not less than 40,000 square miles, according to Dr. E. H. Sellards, director of the bureau of economic geology of the University of Texas. He says that more than one hundred oil wells, drilled in west Texas, have penetrated salt beds.

"These wells are distributed over an area of 100 or 200 miles wide by about 400 miles long, including not less than 40,000 square miles," he continued. "The records obtained from these wells, together with other considerations, indicate that salt beds underlie this entire area, extending also into New Mexico on the west, and into Oklahoma and Kansas on the north. Although the salt beds vary in thickness from place to place, the well records indicate beds of as much as 400 or 500 ft., while some wells have passed through a total of more than 1,000 ft. of salt.

"Salt has been reported in the counties mentioned at depths in feet as follows: In the Panhandle of Texas, Armstrong, 1,020 ft.; Carson, 645; Donley, 810; Hartley, 1,610; Oldham, 660; Potter, 692; Randall, 310; and Lipscomb, 940; on the High Plains, Garza, 535; Hale, 1,760; Howard, 930; Lynn, 1,930; at the foot of the High Plains, Childress, 848; Collingsworth, 522; Dickens, 570; Hall, 730; Kent, 232; Mitchell, 850; Scurry, 695; on or near the Pecos River, Crane, 590; Crockett (northwest part), 945; Loving, 920; Pecos, 962; Reagan, 1,027, and Ward, 1,000.

"Associated with the salt is potash, the amount of which is yet to be determined. Although at present no mining is being done in this part of the state, it is not too much to expect that the future will see an industry founded on these valuable products. Formerly salt was made from water taken from springs and wells at Colorado, in Mitchell County. Some salt is obtained also from salt lakes in Culberson and Hudspeth counties.

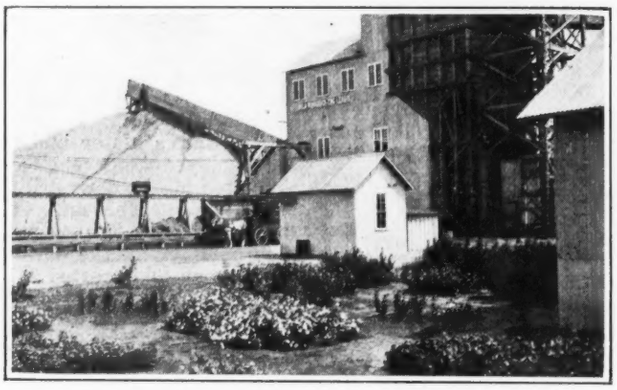
"The salt now being mined in Texas is taken from the domes of the inner Gulf Plains region, Palestine dome in Anderson County, and Grand Saline in Van Zandt County. At each of these places a salt brine is pumped from wells drilled into the salt mass and the salt is obtained by evaporation from the brine.

Flower Beds vs. Junk Yards

A few months ago a supply salesman in the Joplin-Miami zinc and lead district suggested it would be a fine idea if the mining companies would plant flowers about their concentrators, to replace the indiscriminate debris of rusting machinery and scrap lumber that so frequently is found there.

The suggestion was well received, and many companies have planted flower beds on their premises. The accompanying picture shows a view of flowers and mine buildings together that could not possibly have been taken a year ago. It is of the Oklahoma Woodchuck Zinc & Lead Co.'s property, but the scene can be duplicated at numerous mines.

The influence of this improvement is said to extend beyond the mines, too. Miners have been overheard to boast to workers at other properties about their flower beds, and some have been heard to relate how they have been encouraged to have a flower bed at their homes.



Scrap yards replaced by flower beds at Woodchuck mine

Ray Copper Provides Buses for School Children

The Ray Consolidated Copper Co. has purchased two new passenger buses for transporting high school students between Santa Rita and Hurley. As the result of extensive changes in Santa Rita there is no appropriate site available for the erection of a high school building; however, the new school building erected at Hurley last year is able to provide for the accommodation of high school students from Santa Rita, and these students will be furnished transportation by the company.

The parents are assured of the safe and comfortable transportation of their children in the trips back and forth from Santa Rita to Hurley. A member of the teaching staff of the school will accompany the children on all trips.

Extensive Development in Tintic District

The remarkable accomplishments of the Tintic Standard mine, near Eureka, Utah, since its first important discovery not ten years ago, causes companies in the East Tintic district to continue development with unabated ardor.

At the Independence property of the Silver Shield Mining Co., shaft sinking will soon be resumed. The new shaft of the South Iron Blossom Mining Co. has been sunk to a depth of 50 ft. Two headings in the North Standard are being driven on the 850 level on fissures showing good mineralization. Exploration continues at Iron King.

Richmond-Eureka Co. Shipping Ore

Shipments have been started from the Richmond-Eureka mine of the United States Smelting, Refining & Mining Co. at Eureka, Nev. According to Superintendent George Oswell, ore for the first shipment was taken from the seventh and eighth levels of the mine by leasers. Regular shipments to the Midvale, Utah, plant will continue.

Sales of Mines Pending Results From Goldfield Deep Shaft

The Goldfield Deep Mines shaft is down more than 1,850 ft., and for some distance has been in quartz showing mineralization. It is reported that negotiations are under way between owners of nearby mining property and Eastern financial interests, indicating increased interest in the district based on the showings in the Deep Mines shaft.

Prince Consolidated Resumes Ore Shipments

The first carload of ore shipped in recent years from the property of the Prince Consolidated mine at Pioche, Nev., arrived on the Salt Lake market.

News From Washington

By PAUL WOOTON
Special Correspondent

Bureau of Mines and Bureau of Standards

Preliminary Survey Shows No Duplication of Work Even When Engaged on Problems Affecting Different Branches of the Same Industry

A PRELIMINARY SURVEY of the activities of the Bureau of Mines and Bureau of Standards reveals no duplication of work. In a number of instances the bureaus are working on problems that affect different branches of the same industry, but without conflict. For instance, both bureaus are doing research work on lubricants. The Bureau of Mines is engaged on problems involved in their manufacture. The Bureau of Standards is studying them from the standpoint of use.

As the study of the bureaus of the Commerce Department proceeds it is becoming increasingly apparent that it will be difficult to effect reductions in appropriations without curtailing work. If such a step should be found necessary, it is believed that the advisory committee, of which J. W. V. Reynders is chairman, would be a good agency to indicate what work should be dropped.

The research work of the Bureau of Mines has been undertaken largely in response to a demand from industry. The division of mining research has an advisory committee of its own headed by Dean Probert of the University of California. A meeting of this committee is to be held in Salt Lake City the first week in September. This is one of the efforts of the bureau to keep its work in line with the desires of industry. The expectation in the Bureau of Mines is that the Reynders committee will find that it has succeeded very well in that particular. At any rate, the bureau has ready for submission to that committee an imposing collection of letters from the industries touched by its work, which testify to the worth of the work it is doing.

It is recognized that the question as to how much has been saved by the transfer of the bureau will soon be asked. Some are of the opinion that no saving can be effected, because no duplication existed before the change. They compare the transfer to the placing together of two tables., It contributes to the success of the dinner party but does not reduce the amount of food consumed.

Although there is a feeling among those studying the subject that any who are expecting reductions in appropriations are doomed to disappointment, the opinion held most generally is that the change will improve the service the federal government renders the mining industry. Before the effort has proceeded far, some think, it will be found necessary to transfer the Geological Survey as well.

The greatest benefit likely to flow from the change is expected from the opportunity now afforded to give greater recognition to mining by altering the name of the department to that of "Industries and Mines" and the grouping of all activities relating to mining under an under-secretary of the department.

Permanent Mining Operations Assured at Fairbanks, Alaska

From what is known of the plans of several large mining companies the Fairbanks district of Alaska is assured of a permanent placer industry, according to J. A. Davis, for several years superintendent of the mining experiment station at Fairbanks, who now is in Washington serving as assistant to the director of the Bureau of Mines. Enough dredging ground is known to be available to keep a large fleet of dredges in operation for a long period of years, Mr. Davis says.

"These operations will have a very important bearing on the future of the district," Mr. Davis declares, "as they will give stability to the community and will stimulate prospecting and encourage operation by others. The covering of vegetation and muck makes prospecting particularly difficult. This district would benefit particularly were some scientific method of detecting orebodies perfected.

"Although the prospector has a virgin field and the district apparently offers opportunities for mining on a small scale, there is greater promise for large-scale operations that can employ the best equipment.

"These large operations have been made possible by the railroad. The values to be recovered were not sufficient to justify exploitation until heavy machinery could be transported readily and until supplies could be had quickly and at relatively low cost."

German Iron and Steel Industry Depressed

At a recent meeting of the Association of the German Iron and Steel Industrialists the debates and resolutions dealt with what could be done to improve the present unfavorable status of this industry, says Consul H. B. Quarton, of Coblentz, in a report of the Department of Commerce. Commenting upon business conditions and the situation of the individual concerns, Reichstag Deputy Reichert called attention to the fact that the works had made no so-called "inflation reparations and Ruhr struggle profits," but on the contrary that considerable losses had occurred due to the separation of the Lorraine iron ore mines, the destruction of plants, governmental control, the Ruhr occupation, etc. The German iron and steel industries were alleged to be in a more distressed situation than any other branch. There is no possibility of reducing the cost of production, the only outlet being a reduction in wages. It was proposed to found a corporation having a reasonable price policy for domestic sales and one that would duly consider the fluctuations on the international market. It was claimed that the formation of such a cartel would prove to be in the interests of the refining industry and the direct consumers. It was decided that the importations of iron into Germany should be reduced to the pre-war level.

German Mining Industry in a Critical Condition

Further closing down of mine shafts and iron and steel works, and the dismissal of directors and clerical staff, indicate the critical condition of German industry. A change in 30 per cent of the personnel has been decided upon by the directors of the Thyssen Konzern, and a similar situation prevails in other companies, including the Phoenix, the Hoesch Works, Gelsenkirchener Works, Charlottenhuette A. G., Krupp, etc. Coal production continues at 50 per cent of normal and raw steel production is expected to be reduced another 5 per cent, to 70 per cent of normal. Government aid to the coal industry is being planned in order to avert a financial crisis. Syndication of the domestic market is being effected in all branches of semi-finished iron and steel.

Prosperity of Bolivian Tin Mine Increases Demand for U. S. Machinery

The financial and economic structure of Bolivia is closely related to minerals, and both government revenue and private business are favorably affected by the general condition of prosperity that now exists in the mining industry of that country. Since Bolivian tin output comprises between 40 and 50 per cent of the world's total, the significance of present high tin prices is evident. Since the middle of May there have been heavy imports of American hardware, steel, and corrugated iron sheeting, the latter used extensively for roofing in the cities as well as in mining communities. Imports of automobiles continue unusually heavy. Having demonstrated its superiority in operating Bolivian mines, American mining machinery continues to dominate the Bolivian market. There is an increase in the installation of electrically propelled machinery in the copper and tin mines.

Franklin Fluorspar Co. Absorbs Other Mines

The fluorspar mines of the Aluminum Ore Co., the Kentucky Fluorspar Co. and the Fairview Fluorspar & Lead Co. have been consolidated and will be operated by the Franklin Fluorspar Co. Main office of the Franklin Co. is in Paducah, Ky., and John T. Fuller is president and general manager.

Boundary Limits of Marble and Calumet, Minn., Changed

Recently a portion of the Hill Annex mine at Calumet, Minn., was transferred for taxation purposes from the village of Marble to the village of Calumet. This increases the valuation of Calumet $416,000 and gives it 80 acres north of its original plat. It required a special act of the State Legislature to give the County Commissioners power to detach territory from one village and add it to another. This transfer settles a long-standing dispute between the two villages over this mine.

Contract Let for Ore Dock No. 1 at Allouez

A contract of $100,000 for steel construction on the Great Northern ore dock No. 1 at Allouez was awarded to the Sanitor Construction Co., Minneapolis. The contract calls for completion of steel structure by April 1, 1926.

New Crushing Plant, Oliver Iron Mining Co., Started

The new crushing and screening plant of the Oliver Iron Mining Co. at Hibbing started one unit July 20. With only one unit operating, the plant screened and crushed 10,395 tons of ore in 395 minutes with ore about 8 per cent over 7 in. in diameter. This is at a rate of over 2½ tons per minute and is considered a satisfactory performance, although larger production is expected after the plant and crew get better acquainted.

Indian Iron and Steel Market Quiet

According to cable advices to the Department of Commerce from Bombay, the Bengal Iron & Steel Co. has dismissed 5,500 employees due to curtailment in production, owing to a slackening of demand. The Tariff Board is now going thoroughly into the question of extending the pig iron bounty for another year.

Tungsten Ores in the Huachuca District, Ariz.

The opening of a market for tungsten ores has given miners in the Huachuca district hope for a sale of a large quantity of ores already on their dumps. Another tungsten district is that in the neighborhood of Dragoon station, on the Southern Pacific Railroad, where considerable high-grade ore was mined and shipped during the war. The Primos Chemical Co. owns a number of tungsten claims in this district.

Cinnabar Discovered Near Tepic, Mexico

A group of claims has been denounced covering what is claimed to be a new and extensive discovery of cinnabar ore. The denouncer, A. Andersen, an American residing at the Brandes Hotel, Tepic, states that the property is about forty miles east of Tepic, in the Las Palomas mountains. Mr. Andersen states that the surface dimensions indicate practically 750,000 tons of ore in sight, averaging about 2 per cent mercury.

Mexico City Letter

By W. L. Vail

Special Correspondent

Proposed Federal Legislation in Lieu of State Mining Laws

Mexico City, July 20—It is probable that legislation will be introduced at the next meeting of Congress looking toward a Constitutional amendment giving the federal government the right to legislate relative to mining operations. At present each state has such right, but so far there has been a great variance in laws regarding labor, wages, sick benefits, and apportionment of profits, while a majority of the states have not even taken the matter up. Federal legislation will be more satisfactory to the companies as well as to the workmen because of the uniformity, as well as the fact that the Congressional body in the City of Mexico is better prepared to legislate in the matter than the various state legislatures.

Reports from Guaymas state that five carloads of graphite are being shipped weekly from the San Marcial district to Michigan. The camp is relatively new and all modern conveniences have been inaugurated.

The new production tax recently put into effect by the Treasury Department is meeting with almost universal opposition on part of the mine owners. Although a slight reduction in some cases resulted from the new rate, the extra cost of assays and other incidentals resulting from the change in methods of assessment bring the cost up considerably over the old rate. One example has been forwarded to the Treasury Department in which the original tax on nine carloads of ore amounted to 54 pesos, while under the latest decree it amounts to 339 pesos. The difference is due entirely to the extra assay charge under the new ruling.

About 1,500 workmen at the Cinco Minas property in the State of Jalisco are threatening a strike for higher wages, an 8-hr. working day and some minor demands. The situation has been made more difficult by the killing of eleven miners last week, when a cage in which they were riding plunged 100 ft. to the bottom of the shaft. The accident was caused by the breaking of a cable. Cinco Minas is owned mostly by James Gerard, of New York.

A small smelter is under construction at Las Batuecas, just outside of Guaymas, and it is expected to be in operation before the end of the year. Several new mining properties are being worked in the vicinity.

Northern papers state that the Moctezuma Copper Company is reducing expenses in various camps throughout the State of Sonora by suspending operations one day each week, in some instances, and cutting the working force 25 per cent in others. The continued low price of copper is given as the reason.

Labor Shortage Decreasing at Mexican Mines

An improvement in labor conditions in many of the mining districts of Mexico is reflected by an increase of ore production, according to reports received from Monterey. It is stated that while several of the larger mining camps are still seriously affected by demands of workers for higher wages, these difficulties are being gradually overcome. Foreign capital continues to hold aloof in the matter of investments in mining properties, but an unusual amount of development work is being carried on by Mexican companies, firms and individuals.

The San Rafael Mining Co. is making extensive improvements to its ore-reduction plant at Pachuca, State of Hidalgo. The capacity of the mill will be increased to 600 tons of ore a day.

Production Increases at Sierra Mojada, Mexico

By John W. Beard

Mining activities in the Sierra Mojada district, Coahuila, Mexico, during the last two years have resulted in increased productivity. The principal operators are Cia. Minera de Peñoles, S. A., Cia. Arrendataria de Minas, and lessees of properties owned or controlled by the A. S. & R. Co., and the Peñoles company.

The Cia. Minera de Peñoles controls more than two-thirds of the mineralized portion of the district and is carrying out an extensive program of development. The tonnage of ore produced by this company has been increasing and although no new orebodies of large size have been encountered, numerous small ones have been found.

The Cia. Arrendataria de Minas is operating a number of properties under lease, principal among which is the Segunda Zona group, in which development work was recently started.

The other operators in the camp are actively engaged in the mining of mixed lead and zinc sulphides carrying silver. These latter companies are doing very little exploratory work.

The ore production of the district for the first six months of the year was 35,945 wet metric tons. The shipments for the month of June exceeded those made in any previous month during the last eighteen years. The shippers of the June tonnage and the respective quantities shipped are: A.S. & R. Co. lessees, 1,265 metric tons; Cia. Arrendataria de Minas, 322; Cia. Minera de Sierra Mojada, 77; Cia. Minera La Parreña, 4,085; Constancia group, 2,200; a total of 7,949 metric tons.

The Cia. Minera de Peñoles, S. A., has the operating control of the last-named two groups, comprising the properties of Cia. Minera la Parreña, S. A., and Cia. Minera la Constancia, S. A. It also has under lease the Fronteriza mine, which has become one of its best producers.

Approximately 45 per cent of the present production consists of lead carbonate ores, 25 per cent of zinc carbonate ores, 10 per cent of silver ores and the remainder of lead-zinc sulphide ore.

Melbourne Letter

By Peter G. Tait

Special Correspondent

Consolidation of Kalgoorlie Mines Recommended

Early Operation Under Many Units Resulted in Waste, Inefficiency, and Exhaustion of High-Grade Ore

Melbourne, June 30—The report presented to the Western Australian Government by Kingsley Thomas, the Rand mining engineer who was brought to Australia to investigate the position of the industry and the prospects for the future, states that on the Kalgoorlie mines there has been great laxity of control in mining operations; an absence of effort to battle against adverse conditions, and a failure to realize the true value of the mines and the ultimate profit to the companies by a vigorous, progressive policy. This attitude of inertness, inactivity, and inability to grapple effectively with mining, metallurgical, and industrial problems has been aggravated by the seven big mines of the Boulder belt being kept as seven watertight compartments, each entirely separate and independent of others, and each manager jealous of his position and unwilling to seek information outside, being responsible only to a board of directors (in London) 12,000 miles away. There was seven of everything except modern appliances and appreciation of up-to-date mining practice. Two managers were excepted—those of Boulder Perseverance, and Lake View and Star.

The general appearance of the mines on the surface gave the impression of desolation, despair, and ruin, which was only accentuated on closer investigation. In actual mining the field had the advantage in greater width of lodes against the Rand, but this was counterbalanced by more difficult treatment.

He recommends reorganization and the amalgamation into one property with one manager instead of seven, and one London office. A comprehensive program of development is advocated. Further, he recommends working from one shaft on the Ivanhoe or Chaffers, and another on the Perseverance to hoist the whole tonnage with single-shift work underground, which would largely improve the miners' health and combat the dust menace. In regard to ore treatment, he suggests this should be centralized, and the Chaffers plant belonging to Lake View and Star enlarged to treat 25,000 tons monthly. The flotation process gives indications of successful results, and investigation may lead to its adoption as the most effective economic process. The appointment of a consulting engineer and a small local committee of direction is suggested. An enthusiastic capable general manager would save thousands of pounds monthly in the curtailment of overhead charges, and the scrapping of the present obsolete plant would bring a like profit. Labor efficiency has been lamentably low, but whether this was due to absence of discipline and control or want of proper appliances he would not say. Given adequate control, costs should be reduced to below 25s. per ton, and tonnage raised to more than 100,000 tons monthly. The field should be worked profitably for another twenty-five years.

Referring to the Chamber of Mines, the report says its influence has been remarkably modest, and has missed the main functions of such a body. The absence of efforts at social welfare is deplored. Regarding outside fields, the report says any intelligent policy of development should revive many abandoned centers, but without efficient initial work and capital there was not much hope of a revival. He recalls with pleasure his visit to the Sons of Gwalia, and the satisfaction it gave him to find at a mine such a realization of eventual economy and up-to-date labor-saving appliances.

Johannesburg Letter

By John Watson

Special Correspondent

Rand Gold Production Increases

Many Semi-Annual Dividends Declared —Prince of Wales Visits Mines

Johannesburg, June 30—The monthly output of Transvaal gold for May was declared by the Chamber of Mines on June 10 as 813,249 fine ounces, having a value of £3,454,462. Compared with April, these figures show an increase of 25,730 fine ounces in quantity and £109,294 in value. Among the most notable increases are Crown Mines, showing 4,649 fine ounces. New Modder 3,114, and Brakpan 2,049 fine ounces. The native labor returns show a decrease of 3,206 "boys" employed on the Witwatersrand gold mines on May 31 as compared with April 30.

At the annual general meeting of the Chemical, Metallurgical and Mining Society, held on June 27 at the Scientific and Technical Club, Johannesburg, H. A. White, consulting metallurgist to the Union Corporation, Ltd., was elected president. A council of twelve was also elected by ballot. H. H. Paine gave a demonstration of vacuum pumps and gages, illustrating "The Production and Measurement of High Vacua." A film was also exhibited, "Ball Paths in Tube Mills," showing movements of objects in revolving tube mills.

On the Johannesburg Stock Exchange operations were much broken by holidays in connection with the visit of H. R. H. the Prince of Wales. There were two full holidays and two half days. On Thursday morning, June 25, the Prince of Wales donned an overall suit and descended to the nineteenth level of the Crown Mines, which is 3,200 ft. deep. He was escorted around the workings by A. J. Walton, manager. The Prince asked many questions and was undoubtedly much interested in the various aspects of gold mining. On returning to the surface, he had a chat with "Bob" Bruce, the driver who had raised and lowered him; he also saw the signaling arrangements and the mammoth winding engine. Johannesburg has been very gayly decorated and illuminated in honor of this royal visit.

London Letter

By W. A. Doman

Special Correspondent

Union Government Proposes Representation on Mining Directorate

London, July 21—Directors of Transvaal mining companies, whether in Africa or in London, are up in arms against the proposal of the Union Government to nominate a member of each board of directors. This member, it is said, is to be a kind of watchdog, and the companies protest that there is no need for such a step, as their annual reports give full information to shareholders. According to the bill, the government nominee will not possess a vote, and as his remuneration is to be on the same basis as that of the other directors, there does not, on the face of it, seem any injury to the company or the present boards. It may be that the authorities think they would be kept directly informed of affairs and developments and disputes without the roundabout way of the Chamber of Mines. It is not at all improbable that difficulties would arise, but first-hand information is always useful.

With regard to platinum companies—and the shares are being largely bought again—it is stated that a process has been invented in the Transvaal for the extraction of platinum and the treatment of refractory ores on a commercial basis. A full description has not been given, but it is said that the ore requires no previous treatment. One unfavorable sign of the present movement is that "ramp" companies are beginning to make their appearance.

At last there seems to be something definite in the way of a move for the joint working of the East Rand Proprietary Mines and its neighbor, the Cinderella Consolidated. The proposal is to reduce the nominal value of East Rand Proprietary shares from £1 to 10s. and then exchange at the rate of one East Rand for three Cinderella. It is time something was done, as both companies are overloaded with nominal capital, and both could use more cash.

As there is a speculative fever on the Stock Exchange, mainly in rubber shares, an attempt is being made to attract buyers to mines. Tin descriptions are shooting ahead and other base metals are looking up.

H. F. Marriott's book, "Money and Mines," has had on the whole a very favorable reception, and I understand a cheaper edition for sale abroad is in course of preparation. The book is entirely on original lines, is written with inside knowledge, and in some respects is very critical. It is intended not only for investors in mining companies but also for mining directors and consulting engineers. The chapter on Mine Valuation is especially interesting, and points out how gross profits have to be reduced before net profits are arrived at. The Council of the Institution of Mining and Metallurgy takes exception to one paragraph in the book—a question as to what the Council's functions should embrace.

Situation at the Mines

By Albert H. Fay
Assistant Editor

THE PRODUCTION of zinc and lead continues to be somewhat curtailed, while the shipments of iron ore are increasing, as is usually the case as the season advances toward the time when Lake transportation closes for the winter. Lead continues with but slight changes, except possibily it is a little more active by reason of a slight increase in price. Active search for new lead-bearing orebodies is stimulated by reason of dwindling reserves. The price of zinc and copper increased slightly. The following table shows average prices for six months:

Average Metal Prices

Period	Copper	Lead	Zinc	Silver
February	14.463	9.428	7.480	68.472
March	14.004	8.914	7.319	67.808
April	13.252	8.005	6.985	66.899
May	13.347	7.985	6.951	67.580
June	13.399	8.321	6.99	69.106
July	13.946	8.151	7.206	69.442

Mining Dividends Increased. Dividends for July show a moderate increase over those of previous months. Among the companies that resumed or increased dividends are: Inspiration Copper, Keystone, Magma Copper, New Jersey Zinc, Silver King Coalition, and the Mining Corporation in Ontario. Many other companies increased their regular quarterly dividend in July.

Copper. The Michigan district produced less copper in July than in June. Output was estimated at 12,900,000 lb. Calumet & Hecla Consolidated produced 7,500,000 exclusive of Isle Royale, a subsidiary, which produced 750,000 lb. Estimated outputs of Calumet & Hecla Consolidated units are as follows: Ahmeek, 2,600,000; Calumet reclamation plant, 1,500,000; conglomerate and Osceola lodes, 2,400,000; North Kearsarge, 400,000; Tamarack reclamation plant, 600,000. Other outputs: Mohawk, 1,400,000; Quincy, 1,250,000; and Copper Range, 2,000,000.

Calumet & Hecla Consolidated had copper on hand to the value of $5,263,898.77 on June 30, according to the earnings statement for the April-June quarter. Reduced to pounds, the company's metal stocks were 38,352,632, based on the price, delivered, June 30, of 13.725c. per lb. This is a reduction of 6,915,333 lb. from the amount on hand April 1, when 45,267,965 lb. was carried.

The impending shut-down of the Mammoth smelter promises to bring a sharp drop in California copper production of about 1,500,000 lb. per month, which will be partly compensated for by operations at the Bully Hill and Afterthought mines in Shasta County. Engels, Walker, and Calaveras Copper are operating at their usual capacity and are producing in the aggregate more than 3,000,000 lb. per month.

The Iron Cap Copper Co., Copper Hill, Ariz., curtails production to the extent that the mine is operating at 25 per cent capacity. The Superior & Boston, near Iron Cap, discovered a promising new orebody. The construction of the Inspiration leaching plant is being rushed by employing a night shift of 100 men. The Phelps-Dodge smelter at Clifton, Ariz., is making plans for utilization of coal at the smelter. The Miami Copper Co. is milling 9,000 tons per day. The Arizona Bagdad Copper Co. is trying the experiment of leaching copper ore in place without preliminary breaking of the ground by caving, as is done by Ohio Copper Co. It is certain that part of the copper will be recovered, but completeness and efficiency of the process remain to be proved.

The Katanga copper mines show a marked increase in production for the first six months of the year—viz., 48,928 tons, as compared with 40,604 tons for the same period in 1924.

Zinc. July in the Joplin-Miami district was marked by a considerable curtailment of production on account of the Fourth of July holiday, most mines closing for two days, many for a week, and a few for still longer periods. Production at the close of the month had mounted once more to about 14,500 tons per week of zinc ore. Lead ore producers are holding their product almost unanimously, expecting higher price. Many of them have been holding since the price dropped to $90 a ton, and most of them will not sell until the price gets at least to $120.

Representatives of the German zinc smelters visited the Coeur d'Alene district in quest of zinc ore. So far as known no contracts were obtained, as the present production is taken by the Anaconda Copper Co. and Belgian smelters.

Important zinc discovery by the Bunker Hill & Sullivan Mining & Smelting Co. (Idaho) has been reported from northern Ontario.

Silver. Probably the outstanding feature in the silver industry is the discovery of rich new orebodies at South Lorrain. Reports from Tonopah show a slight drop in production during June as compared with May.

Silver-Lead. The Mason Valley Mines Co. has won a rate decision from the Interstate Commerce Commission based on mileage, enabling it to compete with Utah smelters on California ore. The smelter will not open on Aug. 10, as expected, although mine and smelter will be in shape for operation by that time. At Mina the Mabel mine of West End is shipping two cars high-grade silver-lead ore per month. The Simon Silver-Lead is operating the mine on development work only. At Tonopah the production rate is unchanged, the estimated July value of production being $200,000. There is active development in all sections.

Lead. Among the outstanding features of the mining situation during the month of July in the Coeur d'Alene mining district was the strike of the great Hecla orebody 800 ft. below the 2,000-ft. level, the present lowest development of the vein. On the 2,000 level the ore shoot is 1,800 ft. long and averages 20 ft. wide.

During the latter part of the month the Hecla company started the construction of a tailing mill of 600 tons daily capacity, which will make an addition to its revenues.

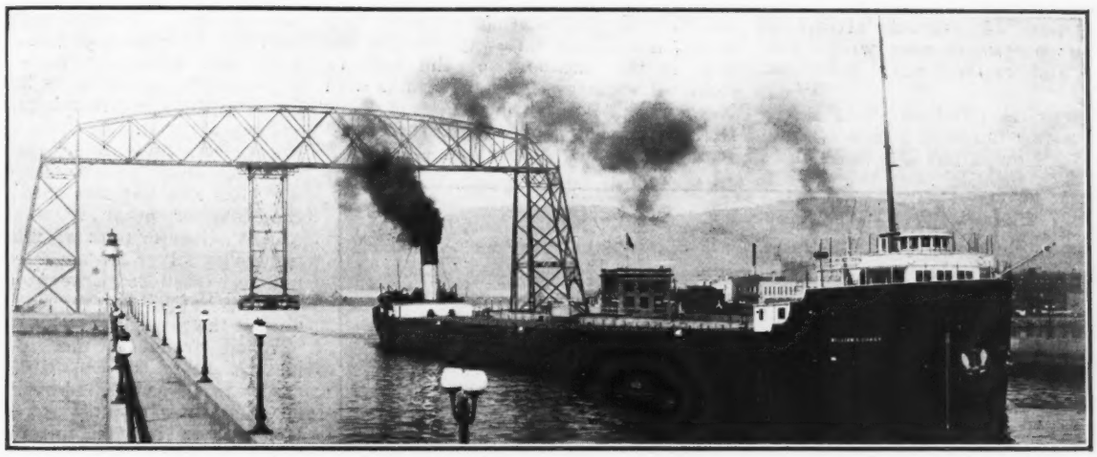
Albert C. Boyle, chief geologist for the Union Pacific system, returned to the Coeur d'Alene in July to complete his investigations of the ore tonnage in sight on Pine Creek. He is making a thorough study of the situation and it is confidently expected that his report will warrant the railroad in constructing the long-delayed branch. The demand for zinc and the desire of the Belgian smelting interests to contract for all that is offered have given an impetus to mining on Pine Creek which promises to become an important field for the production of both zinc and lead.

Gold. The gold production of the Rand for the first six months of the year showed a marked increase over a like period of 1924. The U. S. Tariff Commission recommends an increased duty on gold leaf. The Tom Reed mill (Ariz.) continues production at about $40,000 per month. Plans for the sale of the White-Caps Mining Co. of Nevada are approved by the stockholders. There is a renewal of activity at a number of the mines at Placerville, Calif. The Teck-Hughes Mill at Kirkland, Ont., is being enlarged. The July report shows a slight increase in production at the Dome mines, Porcupine, Ont.

Iron. An optimistic feeling seems to pervade the Mesabi range that production will increase materially for the rest of the shipping season. Predictions are made that 50,000,000 tons will go down the lakes this year, and as only about 18,000,000 tons has been shipped to date, a heavy shipping program will be necessary to get out the ore in the three and a half months left before navigation closes.

The most important announcement of the month is that Henry Ford has procured from the Palms-Book Land Co. an option, with the privilege of leasing, on 2,200 acres on the Marquette range. Drilling has been started. This is important because Ford has insisted from the time he first entered the mining field, five years ago, that he would not accept options or leases, caring only for fee interests. The one mine he has at present is miles away from any other producing mine.

The State of Minnesota appropriated $15,000, available July 1, to be used by the University of Minnesota in conducting tests for the utilization of low-grade iron ores, of which the state has enormous reserves.



One of the huge iron-ore carriers at the entrance to Duluth harbor

The famous aërial bridge that spans the neck of the harbor is seen carrying a street railway car from Duluth to Superior, Wis.

Societies, Addresses, and Reports

Duluth, the "Iron Ore" City, Holds Jubilee

Gateway From Minnesota Iron Ranges Largest Fresh-Water Port—City Fifty Years Old

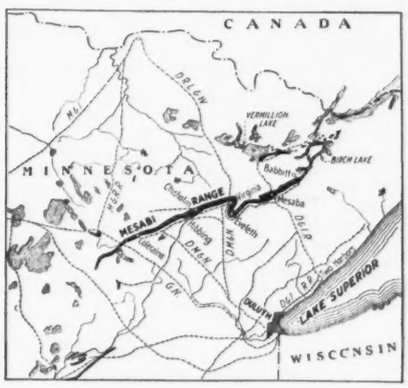
By Dwight E. Woodbridge
Mining Engineer

IRON MINES made Duluth. In appreciation the city called the big civic celebration just finished the "Iron Ore Golden Jubilee." Iron ore was discovered in northern Minnesota somewhat more than sixty years ago. The city is fifty years old and mining began in the state forty years ago. The exposition held under the auspices of Duluth's active and progressive Chamber of Commerce commemorated all these events.

Exhibits by the Minnesota Steel Co. showed as fully as practicable the processes of making steel and steel articles from Minnesota ore, and a full line of its products, arranged in an interesting and attractive way. Also there were many photographs of exploration and mining activities, taken from files of the Oliver Iron Mining Co., together with quite complete photographic representations of the work of such allies as the Universal Portland Cement and the American Bridge companies. The pioneer iron-ore transportation line, the Duluth & Iron Range, exhibited its early type of locomotive and ore car, used by it when ore movement began in 1884. Weather during the entire week was delightful and there was a large attendance, paid admissions alone having been in excess of 100,000. It is hoped to make this affair an annual summer event for the world's largest fresh-water port.

Northern Minnesota, whose first iron-ore shipment was made in the fall of 1884, had, to the close of 1924, sent forward no less than 741,250,083 tons, or 63 per cent of all iron ore shipped from the Lake Superior region and Mayville since the beginning of time. This remarkable growth has brought people and prosperity to a region before then a wilderness, and has had a wide effect on the course of empire.

J. G. Norwood, a member of the David Dale Owen party carrying on geological explorations of parts of Wisconsin, Iowa, and Minnesota, in 1850 made the first published allusions to the presence of iron ore in Minnesota, on the Vermillion range.



The Mesabi range, of which Duluth is the doorway

In 1866 State Geologist H. H. Eames described what he saw in the way of iron ore along the hills of the same lake. But no development was carried out until George R. Stuntz and John Mallman, well-known Duluth surveyors, in 1875 did some drilling and blasting on what is now known as the south ridge between the present city of Tower and the Soudan mine. George C. Stone was interested in this work and secured the co-operation of Charlemagne Tower, of Philadelphia, and as the result of this combination the Duluth & Iron Range Railway was completed from Lake Superior to Lake Vermillion in 1884.

In 1870 Peter Mitchell, a woodsman and prospector from Ontonagon, began systematic explorations on the eastern Mesabi. He traversed the entire easterly part of the range and he went to Vermillion Lake, from which he brought back to Duluth specimens of the hard ores of that locality.

Mitchell secured title to 10,000 acres, which now forms the iron-bearing holdings of the Mesabi Iron Co. Mitchell was probably the first man to enter the region definitely searching for iron ore. His work was reviewed in 1875 by A. H. Chester, of Hamilton College, New York, who was sent to the region by Messrs. Stone and Tower. He was not especially impressed by what he saw there, but did feel that the Vermillion was of importance, and wrote in his report of that year: "The geological similarity of the Vermillion iron deposits to those of the Marquette is the impressive fact to be noted by the people of Minnesota, and it is safe to predict the development of an iron district of immense value and importance."

In 1880, Bailey Willis, working under Raphael Pumpelly for the Census Bureau, visited the "Pokegama iron region" and mapped the course of the underlying quartzites through the Coleraine district of today. Outcrops are marked on his maps as existing at various points as far east as the Nashwauk area. At that time work had been done exposing the iron ore and its interbedded sandstones, a characteristic phase of the iron formation at the western end of the Mesabi. The date of this work is lost in oblivion and it had no economic results, but it undoubtedly was the earliest exploration on any part of the Mesabi. After Professor Willis had observed what iron formations near the Mississippi River that he could see, he returned to Duluth through the trackless forests of this part of the state and again set out, this time up the St. Louis River. He crossed Wine portage, at the head of Embarras Lake, near the Biwabik area.

A few years later the Merritt family, of Duluth, led by the brothers Leonidas and Alfred, discovered indications of iron ore near Embarras Lake and took the land where the Bangor mine now is, and L. Merritt further states that, about 1878, he crossed what is now known as the Mesabi range with a

series of lines of magnetic attraction, beginning somewhere near where Hibbing is and ending near Embarras Lake.

Fifty years ago Duluth was a settlement of a few hundred people without a railway. Now it has a population of 115,000; is the terminal of nine railroads, and is the gateway for the ore that is the backbone of the nation's foremost industry—steel. It ranks with New York, San Francisco, and New Orleans in point of tonnage received from and loaded onto ships.

Buffalo pit at Hibbing, Minn.
A typical open-cut iron mine on the Mesabi range, from which comes about half of the iron ore mined in the United States.

Silver Producers Hope to Facilitate European Purchases

Directors of Association Meet at Salt Lake City, Aug. 10—Will Consider Reintroduction of "Little" Pittman Act

By Gail Martin
Special Correspondent

REPRESENTATIVES of the largest silver-producing companies in the United States will meet in Salt Lake City on Aug. 10, when the board of directors of the American Silver Producers Association convenes for its first executive session called by W. Mont Ferry, president. Questions vital to the welfare of the industry are to be considered, the foremost of which is the working out of a plan for financing purchases of domestic silver by central European nations, now in the market but unable to buy because of existing economic conditions.

Germany in particular, according to Mr. Ferry, is desirous of obtaining large amounts of silver in order to restore confidence among its citizens. Germany will be a large consumer if arrangements can be worked out whereby silver can be purchased at an equitable price. Other nations also are anxious to bolster up their credit by extending the use of silver in subsidiary coinage. Present tariff restrictions, however, prevent these nations shipping goods to America, as they would like to do in exchange for silver, and a deficiency of gold prevents outright purchase. It is hoped that some plan may be adduced whereby special tariff arrangements can be arranged in order that these nations may market in the United States certain goods not manufactured here in great amount, so that purchases of silver may be made.

Second in importance will be consideration of reintroduction of the Pittman bill at the next session of Congress for the repurchase of 14,500,000 oz. of domestic silver at $1 an ounce to complete the quota of the Pittman act of April 1, 1918, which, silver producers allege, was not fulfilled.

The bill providing for the repurchase of 14,500,000 oz. passed the Senate at the last session without a roll call. It was favorably reported in the House, but because of an unfavorable place on the calendar and rush of business failed to come to a vote.

Another matter to be considered will be a campaign of advertising to promote the use of sterling silver as advocated by the National Association of Silversmiths and other fabricators. Routine matters relating to membership are also to be acted upon.

Silver producers the nation over are taking an active interest in the progress of the new organization, according to reports received by Mr. Ferry. At recent conferences of operators in Washington during the course of the hearings before the Internal Revenue Bureau, regarding the revaluation of silver mines, producers displayed a lively desire for the association to function on a number of problems confronting the industry.

Appeals to join are being made by the membership committee for all classes of persons either directly or indirectly interested in the welfare of the silver-mining industry. In response, a considerable number of brokers, bankers, investors, engineers, prospectors, and operators have joined the organization, which costs but $5 a year for non-producing members.

Fees of producing members are not to exceed one-tenth of one cent per ounce of silver produced in the preceding year and not less that $10 a year. Smelting or other reducing members except when owners of mines actually producing silver are assessed on a basis not to exceed 25 per cent of the total quantity of silver reduced or refined during the preceding year.

When producers met in Salt Lake last August, the constitution of the association was ratified by 95.6 per cent of the silver production of America. During the interim, interest has increased. Foreign companies like the Nipissing, the Cerro de Pasco, and others, including copper companies that produce silver as a byproduct, have evinced a desire to co-operate.

Practically all of the board of directors are expected to attend, according to assurances received by Mr. Ferry. Membership of the board is as follows: W. Mont Ferry, F. Y. Robertson, and E. J. Raddatz of Utah; L. O. Evans and Charles Bocking, Montana; A. M. Morris, Arizona; Alfred Harrell, California; John G. Kirchen and Clyde A. Heller, Nevada; F. M. Smith, Washington; Jesse McDonald, Colorado; Jerome J. Day, Idaho; Robert E. Talley, William Loeb, C. F. Kelley, and F. H. Brownell, directors at large.

Officers of the association are: W. Mont Ferry, president; F. M. Smith, Washington, first vice-president; Charles Bocking, Montana, second vice-president; and Henry M. Rives, Nevada, secretary-treasurer. The executive committee: Messrs. Ferry, Kelley, Kirchen, Loeb, Smith, Brownell, and Robertson.

Students Will Take Special Course at Chemical Exposition

A number of American colleges and universities have filed applications for their students of chemistry and chemical engineering to take the one-week course of intensive training in practical technique of chemical engineering to be held in conjunction with the Tenth Exposition of Chemical Industries at the Grand Central Palace, New York, during the week of Sept. 28. More than three hundred students are expected to enroll before the closing date. All students of recognized colleges, as well as practicing chemical engineers who desire to brush up on fundamentals, are eligible to take the course, which is without cost.

A program of lectures for the course for students is now being made up and will be announced at an early date. Some of the leading authorities on engineering methods, materials, and equipment will be among the speakers. Lectures will be held during the morning hours at the Grand Central Palace prior to the official opening of the exposition each day. Tours among the exhibits for practical demonstrations will also be conducted for the students. Examinations will be held at the close of the course.

Men You Should Know About

L. S. Cates, general manager of the Utah Copper Co., was on a short visit to San Francisco in July.

W. P. Hammon, of San Francisco, recently returned to that city from a business trip to the East.

S. F. Shaw is making an examination of the oil properties of the Grayburg Oil Co., near San Antonio, Tex.

L. S. Grant, professor of mining at the Colorado School of Mines, is spending his vacation in California.

D. C. Jackling, of San Francisco, and **Ralph C. Nowland,** field engineer for Mr. Jackling, are on their way to Alaska.

Colonel Gordon S. Harrington, K. C., of Sydney, N. S., has been appointed Minister of Works and Mines for Nova Scotia.

Russell E. Popham, president of the Amulet Gold Mines, is making a tour of inspection in the Rouyn gold area of northern Quebec.

J. P. Watson, of Toronto, president of the Mining Corporation of Canada, Ltd., has been elected president of the Ontario Mining Association.

William de L. Benedict, consulting mining engineer, of New York, is in San Francisco on business. He expects to be away two months.

E. A. Julian, general manager for the Goldfield Consolidated Mining Co. at Goldfield, Nev., has been in Reno from his San Francisco headquarters.

L. D. Gordon, president and general manager of the Round Mountain Mining Co. and the New Candelaria Mines Co., is in San Francisco on a business trip.

Ralph S. Baverstock, of Baverstock & Payne, Los Angeles, Calif., has returned from an examination of the Tres Amigos Copper properties at Vicksburg, Ariz.

Robert H. Bedford, mining engineer, of Grass Valley, Calif., who has a contract for shaft sinking at the North Star mine in Grass Valley, was in San Francisco recently.

J. J. Beeson and **A. D. Knowlton,** Salt Lake engineers, have sailed for Skagway, Alaska, to examine for Pope Yeatman the Engineer mine, situated twenty-five miles from Atlin, B. C.

F. H. Kilburne, of the Trail smelter, at Trail, B. C., recently visited the new Beardmore gold field in the Port Arthur district of Ontario and took away 150 lb. of samples for assay.

Fred L. Cole, superintendent of the Montana-Tonopah Company Reorganized, at Tonopah, Nev., has returned to Tonopah from an extended examination trip into central and northern California.

H. A. Rands, who was until recently chief construction engineer of the Portland Electric Power Co., has accepted an engineering position with the Hammon Consolidated Gold Fields at Nome, Alaska.

S. C. Ells, of the Canadian Department of Mines, has gone to make a further examination of the tar sands of Fort McMurray district of northern Alberta. The examination will take about five months.

Frederick G. Clapp, of New York, who went to Australia late in 1923, has been since engaged in a careful search for oil in Australasia, visiting most of the critical geological localities of

Frederick G. Clapp

Australia and New Zealand, with some attention to possibilities elsewhere in Australasia. He has now returned to Wellington and expects to return to the United States in the near future. Meanwhile Taranaki Oil Fields, Ltd., which was organized on his advice, started two wells this year in Taranaki, New Zealand, and one of them is now a 5,000,000 gasser at 1,555 ft. It will be put deeper in search of oil, as the company has a full complement of high-grade machinery and casing, and is superintended by Ralph Whittaken of California.

A. C. Fieldner has been appointed chief chemist of the Bureau of Mines. He will continue to serve as superintendent of the station at Pittsburgh and will direct the chemical activities of the bureau from that point.

James L. Bruce, consulting mining engineer, of Salt Lake City, Utah, has been making mine examinations during the month of July near Burley, Idaho, and in the Corbin, Marysville, and Deer Lodge mining districts in Montana.

G. J. Sielaff has been appointed chief geologist in charge of the department of geology of the Southern Pacific Railroad, taking the position formerly held by E. T. Dumble, who has retired after a number of years of service.

John H. Shelburne, president of the Eureka-Nevada Railway, visited Eureka recently, accompanied by Assistant Manager C. B. Sexton. A visit of inspection was paid to several of the mines of the company on Prospect Mountain.

T. F. Sutherland, chief inspector of mines for Ontario, has left for South Africa to obtain information regarding mining methods in that country, for the provincial government. He will investigate more particularly deep mining and disease prevention in mines.

Olaf P. Jenkins, associate professor of economic geology of the State College of Washington, in Pullman, is engaged in private work this summer, owing to the inactivity of the State Division of Geology, with which he has previously been actively associated.

W. J. Loring, formerly connected with the Plymouth Consolidated Mines Co. of California, has become associated with the Big Jim mines in the Patagonia district of Arizona, and will direct his efforts toward operations in the silver, lead and zinc mines of that state.

A. G. Burroughs, Provincial Geologist of Ontario, has been commissioned to make an examination of the geological formation of the locality in Beardmore Township, in the Port Arthur district of northern Ontario, where recent discoveries resulted in a rush of prospectors.

Prof. Willard Rouse Jillson, director and state geologist of the Kentucky Geological Survey, received the honorary degree of Doctor of Science from Berea College at its annual commencement held at Berea, Ky., on June 1. Dr. Jillson is also chairman of the Kentucky State Park Commission, which has been successful in securing during the past year five new state parks well distributed throughout the state without cost to the commonwealth.

Obituary

W. E. Defty, well-known Arizona mining man, died in Los Angeles, Calif., on July 23, as the result of an illness of approximately two months' duration. Mr. Defty was a native of England and went to Arizona thirty-five years ago to join the staff of the Gila Bend Irrigation & Reservoir Co. as civil engineer. Later, he removed to Phœnix, and for the past thirty years had been recognized as one of the leading mining experts in the Southwest. During that period he examined many mining properties for capitalists in different sections of the country, but the majority of his work was confined to the States of Arizona and New Mexico. At one time he was connected with the famous Gran la Proveedora mine in Mexico. For a number of years Mr. Defty was consulting engineer for the Dundee Copper Co., in Jerome, Ariz. Mr. Defty was sixty years old at the time of his death, and leaves behind him a wife and two sons. Suffering from an attack of influenza last winter, from which he never fully recovered, he was finally removed to Los Angeles the latter part of June, but grew steadily worse until death resulted. Funeral services were held in Los Angeles, but interment of his ashes will take place in Phœnix at a later date.

have been for September-October shipment, which is just about the normal forward buying. Practically all August copper has been sold, though two or three producers have ample stocks to take care of any demand for spot copper that may arise.

The present freight rates on copper in so-called Official Classification territory, which embraces the territory east of the Mississippi River and north of the Ohio and Potomac Rivers, may soon be advanced to sixth class rates. It was first decided to make this advance effective Aug. 15, but it is understood that a two-month stay has been granted, pending the hearing of a protest. Some representative rates from Perth Amboy to various points follow, the proposed rate being given in parentheses: Buffalo, $4.60 ($5.30); Chicago, $6.40 ($9.50); Cincinnati, $5.60 ($8.30); Cleveland, $5.00 ($6.70); Detroit, $5.00 ($7.40); Pittsburgh, $5.00 ($5.70); and Rome, $4.50 ($5.00).

Wide Range in Lead Prices

The American Smelting & Refining Co. advanced its contract price for New York lead from 8.20 to 8.30c. on Thursday, July 30; to 8.50c. on Monday, Aug. 3; and to 8.75c. on Wednesday, Aug. 5.

Conditions in the lead market are distressing alike to producers and consumers, to say nothing of those who must report what is a fair market price for the metal. The principal producers do not wish to see a runaway market followed by the inevitable reaction, nor, naturally, do they wish to keep the market down if higher prices are justified by economic conditions. They have not enough lead to take care of all legitimate inquiries, even though they are selling all their intake and not holding up any supplies for future possible higher prices. They are taking care of the urgent requirements of regular consumers so far as they are able, at prices up to 1c. below the rumored quotations of dealers. So far as has been reported, no lead consumer has been forced to curtail his activities because of a lead shortage, but some have been forced to pay fancy prices for small tonnages to take care of their immediate requirements. The total volume of sales at these high prices is considerably less than that sold by the large producers at their inside prices.

The foreign market is largely responsible for the advance, by bidding up prices so high that no foreign lead can come into the United States. Normally, a fair tonnage of Mexican lead ore is imported and makes up for the deficiency in this country, but this has not been profitable for some time, and at current London quotations, lead is actually bringing 8.15c. per pound for prompt shipment. Battery and cable manufacturers are as active abroad as in this country.

The principal seller in the Middle West has continued selling limited tonnages all week at around 8½c. per pound, though some lead has been sold well above 9c., St. Louis. In the East, the tonnage going out at contract prices has been larger than usual; small lots have been marketed at various prices between 9 and 10c. Both August and September have been in demand, with only a moderate inquiry for prompt shipment.

Brass Mills After Zinc

Zinc has sold in good volume during the week ending today, with an especially good demand for the higher grades by brass mills and others. Brass Special has continued to command 10 points premium over Prime Western, and several hundred tons have been sold to various purchasers. The demand for high-grade has also been better than usual, as the price has not advanced along with that of Prime Western, and buyers are beginning to take advantage of that fact; it continues at 8½@8¾c., delivered. Galvanizers are not very anxious to pay over 7½c. for zinc, fearing a reaction. The situation is strong, however, as miners are asking higher prices for their ore, and smelters are not disposed to sell below cost. One large zinc producer has been virtually out of the market for two or three weeks, and another has been buying rather than selling the metal. The export market has been quiet, but foreign demand does not seem to be necessary just now, to maintain the market.

New York prices continue at the customary freight differential of 35c. per 100 lb. above the St. Louis level.

Tin Demand Less in Evidence

Tin has been the only metal that has had a slow sale during the last week. The excellent buying recently has satisfied consumers for the time being, and the higher prices have been somewhat discouraging. A good sale was made to the U. S. Navy Department yesterday. Forward tin is about ¼c. below the price asked for prompt, early deliveries selling today at 59⅜c., with October about 59½c.

Silver Steady and Quiet

Increase in San Francisco delivery of silver for account of China continued good through the end of July. Shanghai's change rate declined somewhat thereafter, and with the August bank holiday in London on the 3rd, Frisco demand slackened and prices reacted slightly. The Indian bazaars are buyers for New York delivery at a little below current rate and the market holds steady, though quiet.

Mexican Dollars: July 30th and 31st, 53⅜c.; Aug. 1st, 53½c.; 3rd, 4th and 5th, 53⅝c.

Exchanges Quiet

Foreign exchanges were generally quiet during the last week, except the Scandinavian. Closing cable quotations on Tuesday, Aug. 4, were as follows: Francs, 4.715c.; lire, 3.6525c.; and marks, 23.805c. Canadian dollars, ⅛ per cent premium.

Steel Prices at Same Level

Pittsburgh, Aug. 4, 1925

Although there is much talk about the iron and steel trade being engaged in rounding a turn, there is more evidence that movement on the down grade has been arrested than that movement on the up grade has definitely begun.

As to steel prices, the general level or average has not changed appreciably for more than thirty days, and there is a little evidence to suggest that on the whole the market is stiffer. Plates and shapes declined a trifle during July, but sheets advanced a trifle. As the market had previously been losing ground, the steadiness represents, in a sense, an improvement.

Except for the continued light buying of railroad rolling stock, all the steel-consuming lines are at least moderately active.

Pig Iron — Foundry iron shows a trifle more activity, while two small sales of basic iron confirm the quotation previously given. Bessemer is dull and unchanged. Bessemer, $19; basic, $18; foundry, $18.50, Valley.

Connellsville Coke—The market is dull, with possibilities of some sales later in the year as an anthracite substitute. Spot furnace, $2.90; spot foundry, $3.75@$4.25.

Zinc and Lead Ore Higher

Joplin, Mo. Aug. 1, 1925

Zinc Blende

High	$55.95
Premium, basis 60 per cent zinc	$54.00@$55.00
Prime Western, 60 per cent zinc	$52.50@$53.00
Fines and slimes, 60 per cent zinc	$52.00@$50.00
Average settling price, all	$49.45

Lead Ore

High	$110.42
Basis 80 per cent lead	$110.00
Average settling price, all	$102.92

Shipments for the week: Blende, 13,769; lead, 1,613 tons. Value, all ores the week, $846,940.

Settlements for ore are one to three weeks behind the purchases, which accounts for average prices figuring lower than basis offerings.

One buyer of zinc started an upward price movement this morning by purchasing on a $52.50 basis. Later other buyers made unsuccessful attempts to buy on a $51 basis, then $52, and finally bid up to $52.50, with one option on 1,000 tons reported late today on $53 basis. The bulk of the ore sold on a $52.50 basis, with $54 for Oklahoma premium and $55 for Waco premium, freight differential accounting for the higher Waco price level.

While offerings for lead were on $110 basis, a large part of the produetion was not sold.

Platteville, Wis., Aug. 1, 1925

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$ 52.50
Lead Ore	
Lead, basis 80 per cent lead	$110.00

Shipments for the week: Blende, 909 tons; lead, 60 tons. Shipments for the year: Blende, 26,944; lead, 1,228 tons. Shipments for the week to separating plants: 1,344 tons blende.

Other Metals

Quotations cover large wholesale lots, f.o.b. New York, unless otherwise specified.

Aluminum—99 per cent, 28c. per lb.; 98 per cent, 27c. London, 98 per cent. £118 long ton. Market firm, with good demand.

The Market Report

Daily Prices of Metals

July Aug.	Copper N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
30	14.00@14.125	57.00	58.50	8.40	8.50	7.35
31	14.125	57.75	59.25	8.40	8.50	7.375@7.40
1	14.125@14.25	57.875	59.375	8.45	8.50	7.375@7.40
3	14.125@14.375	57.75	59.25	8.55	8.70	7.425@7.45
4	14.25@14.40	57.75	59.25	8.65	8.75	7.475@7.50
5	14.375	57.875	59.375	8.80	8.80	7.55@7.575
Av.	14.221	57.667	59.167	8.542	8.625	7.435

*The prices correspond to the following quotations for copper delivered: July 30th, 14.25@14.375c.; 31st, 14.375c.; Aug. 1st, 14.375@14.50c.; 3d, 14.375@14.625c.; 4th, 14.50c@14.65c.; 5th, 14.625c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of *Mining Journal-Press* and a special representative of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce.

London

July Aug.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
30	61⅜	62⅜	66	259¾	262½	36½	35⅛	35¼	34⅞
31	62⅛	63⅛	66½	263½	265¾	37⅛	35⅜	35 9/16	35 5/16
3	....	....	....	....	....	....	....	....	....
4	62⅜	63⅜	67¼	264½	267	37 3/16	36⅜	35 1/16	35 9/16
5	62¾	63¾	67¾	265	267½	37⅝	36 11/16	36 5/16	36

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

July Aug.	Sterling Exchange "Checks"	Silver		Gold London	Aug.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
30	4.85¼	69⅝	31⅞	84s11½d	3	4.85¼	69⅝	....	.....
31	4.85¼	69⅝	32	84s11½d	4	4.85⅜	69⅝	32	84s11½d
1	4.85¼	69½	32	.....	5	4.85¼	69⅝	32	84s11½d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-half cent premium.

Average Metal Prices for July, 1925

Copper:	
New York Electrolytic	13.946
London Standard	61.467
London Electrolytic	65.750
Lead:	
New York	8.151
St. Louis	8.054
London	34.698
Silver:	
New York	69.442
London	31.954
Sterling Exchange	485.514
Zinc:	
St. Louis	7.206
London	34.894
Tin:	
99 per cent	56.683
Straits	58.014
London	258.435
Quicksilver	83.077
Antimony	17.779
Platinum:	
Refined	120.000
Crude	114.346
Aluminum, 98 per cent	27.000

Metal Prices Advance Further in Active Market

New York, Aug. 5, 1925—Renewed buying activity in the non-ferrous metal market, with a further advance in the prices of copper, lead, and zinc, has characterized the week ending today. Supplies of all of these metals are none too plentiful, though so far ample for immediate consumptive requirements. Metal consumers are experiencing better business than they expected at this season of the year, and all fear of the expected midsummer dullness has been pretty well dissipated. Foreign demand has improved since the threat of the English coal strike has been removed.

Copper Sales the Largest in Weeks

Not since the week ended June 17 has copper sold so freely as in the week ending today, and prices have naturally advanced, though sellers have exercised a commendable restraint in marking up their quotations in the face of the excellent demand and the meager stocks. On Thursday, Friday, and Saturday, most of the business was done at 14⅝c., delivered, though a little was released on Thursday still at 14¼c., and 14½c. was realized on orders from Rome and points West. On Monday and Tuesday, 14⅝c. was done on spot copper, with most of the business for September-October at 14½c., and as high as 14.70c. realized on deliveries in Detroit. Today, all offerings at 14½c. seem to have been taken off the market and 14⅝c. is being generally quoted, with good sales at that level and 14½c. realized in the Middle West.

The foreign market has continued quiet, though demand has improved since better news came of the coal strike situation in England. In the last day or two a moderate amount of business has been placed at about 14⅝c., c.i.f., though today practically all American agents have been instructed to go to 14.70@14.75c., and they are not anxious sellers even at that figure.

The copper situation is exceedingly favorable and predictions are freely made that 15c. will be reached before the first of September. Whether the market will advance much beyond that will depend to a considerable extent on how much production is increased; so far, no increases have been reported in spite of the higher prices, but a certain amount of copper is almost certain to be added to production from marginal producers as the 15c. level is reached. Present refinery stocks would have been considered altogether too small for comfort before the war, when consumption was much less than now, but the industry has become so saturated with the idea that plenty of copper is available, as it has been for years, that it refuses to believe that any shortage is likely to be experienced. It must be remembered, however, that it takes two or three months to get copper from the mine to the consumer.

Most of the sales in the last week

Feldspar—Per long ton, f.o.b. cars, *North Carolina:*
No. 1 pottery grade, $5.50@$6, depending upon quality. Market dull.
In *New Hampshire*, per net ton, f.o.b. mines: No. 1, not over 10 per cent SiO_2, $8.50. Ground, $17, f.o.b. mill.
Market fair.
In *New York*, per ton, f.o.b. cars:
No. 1 crude, $8.
Market good.
In *Maine:*
No. 1, ground, $19.
In *Tennessee:*
Pottery grades, $16@$21, according to analysis and mesh.
Tile grades, No. 2 ground, $14@16.
Market very quiet.
In *Virginia:*
No. 1 Porcelain, 140 mesh, $22.
In *Maryland:*
Enamelers' grade, No. 1, $16.
Glassmakers' grade, No. 1, $15; No. 2, $11.50.
Market fair.
In *Canada*, f.o.b. mine:
High potash, $9, f.o.b. Quebec; market good.
Crude, No. 1, over 12½ per cent potash, less than 5 per cent SiO_2, $7.25 @$7.50 per net ton.
Crude, No. 2, 20 to 25 per cent SiO_2, $5@$5.50 per net ton.
Ground, No. 1, 180 mesh, $20 per net ton, bags included.
Ground, No. 2, 180 mesh, $15 per net ton, bags included.

Fluorspar — F.o.b. Middle Western mines, per net ton:
Gravel, not less than 85 per cent CaF_2, and not over 5 per cent SiO_2, $16. Tonnage fair. Some producers holding at $18@$20 rather than sell at a loss.
Ground, 95 to 98 per cent CaF_2 and not over 2½ per cent SiO_2, $32.50 in bulk, $36.50 in bags or barrels.
In Canada, 84@86 per cent CaF_2, less than 5 per cent silica, $18 per net ton, f.o.b. mine.

Fuller's Earth—Per ton, f.o.b. Midway, Fla.:
16 to 30 mesh, $16.50.
30 to 60 mesh, $18.
60 to 100 mesh, $14.
Powdered, imported, duty paid, $23 @$25 per ton.
Market quiet.

Garnet—Per short ton:
Spanish grades, $60, c.i.f. port of entry.
Domestic Adirondack, $85, f.o.b. shipping point.
Canadian, $70@$80, f.o.b. mines.

Gilsonite—Per ton, f.o.b. Colorado:
Jet asphaltum, $36.
Selects, $33.
Seconds (ordinary grades), $25.50.
Peerless black, $32.90.
Market steady.

Graphite—First quality, per lb.:
Ceylon lump, 8@9c.
Ceylon chip, 6½@7c.
Ceylon dust, 3@4½c.
Market fair.
Flake, 10@30c.
Manufactured grades:
Fine ground, crystalline, 8c. up.
Facings, 4@8c.
Foreign supplies scarce and prices expected not to go lower.

Greensand—Per net ton, f.o.b. cars, New Jersey:
Run of mine, $15.
Washed and dried, $20.
Market improving.

Gypsum—Per ton, depending upon source:
Crushed rock, $2.75@$3.
Ground, $4@$6.
Agricultural, $6@$7.
Calcined, $8@$10.

Ilmenite—Concentrates, 52 per cent TiO_2, 1½c. per lb., f.o.b. Virginia points. $60 per short ton, Florida mines.

Iron Oxide (See Ocher)—Standard Spanish red, 2½@3¾c. per lb.
Domestic earth, 1¾@4½c. per lb.

Kaolin—See China Clay.

Lepidolite—$20@$30 per ton for ordinary grades. Nominal.

Limestone—Depending upon source, f.o.b. shipping points; per ton:
Crushed, ½ in. and less, 90c.@$2.
Crushed, 3 in. and larger, 90c.@$1.50
Agricultural, 60c.@$5 for pulverized, depending upon source, purity, and fineness.

Magnesite—Per ton, f.o.b. California mines: Prime white, $40.
Grade "A," $40.
Grade "B," $38.
Market very good.
Dead-burned, $40, f.o.b. Eastern seaboard.
Market slightly below normal.

Manjak — Barbados, in 10-ton lots, c.i.f. New York:
Grade "A," 6c. per lb.
Grade "AA," fine, 8c. per lb.

Mica—
North Carolina prices:
Scrap, $30 per net ton.
Sheet, per lb., No. 1 and No. 2: Punch, 1¼ in., 5@8c.

2 x 2 in., 25c.	3 x 4 in., $1.60
2 x 3 in., 60c.	3 x 5 in., $2.00
3 x 3 in., $1.00	4 x 6 in., $2.40

Dry ground, roofing, 20 mesh, $35 per ton.
Dry ground, 100 mesh, $70.
Market good.
In *New Hampshire:*
Mine run, $320 per ton.
Clean shop scrap, $24; mine scrap, $20.
White, dry ground, f.o.b. New England mill:
20 mesh, $30 per ton.
40 mesh, $45.
60 mesh, $60.
100 mesh, $75.
200 mesh, $85.
Market fair. Considerable bidding for scrap mica has sent price up in recent months. Some grinders said to be paying $25@$30 per ton for scrap mica delivered to mill.
Madagascar, amber, dark, free from iron, per lb., f.o.b. New York, duty paid:

No. A1	$2.65	No. 3	$1.25
No. 1	2.30	No. 4	.65
No. 2	2.10	No. 5	.45

Market slow.

[1]**Monazite**—Minimum 6 per cent ThO_2, $120 per ton.

[1]Price furnished by Foote Mineral Co., Philadelphia.

Ocher — F.o.b. Ga. mines, per ton: $22.50@$25 in sacks; $25@$30 in barrels.
Washed and water floated, $25@$28.
Market fair to good.

Phosphate — Per long ton, f.o.b., *Florida* export prices:
76@77 per cent, pebble, $5.90.
75 per cent, $5.40.
74@75 per cent, $5.15.
70 per cent, $3.50.
68 per cent, $3.10.
Market firm.

Potash—	Bags	Bulk
Muriate of potash 80@85 per cent, basis 80 per cent	$34.55	$33.30
Sulphate of potash 90@95 per cent, basis 90 per cent	45.85	44.60
Sulphate of potash-magnesia 48@53 per cent, basis 48 per cent	26.35	25.10
Manure salt 30 per cent	19.03	17.80
Manure salt 20 per cent	12.55	11.00
Kainit 14 per cent	10.25	8.25
Kainit 12.4 per cent	9.75	7.75

Two thousand pounds net weight, c.i.f. Atlantic and Gulf ports. German weights, tares and analyses.
Discounts for prompt shipment:
5 per cent on minimum quantity of 50 short tons K_2O
6 per cent on minimum quantity of 100 short tons K_2O
7 per cent on minimum quantity of 300 short tons K_2O
10 per cent on minimum quantity of 500 short tons K_2O

Pumice Stone — Powdered, in bbl., 2½@5c. per lb.
Lumps, in bbl., 4½@8c.; 3½@6c. in bags.

Pyrites—Tharsis, per long ton unit of sulphur, c.i.f. U. S. ports:
Furnace size, 13c.
Cinder from ore to remain property of buyers. Market a little more active.

[1]**Quartz Rock Crystals** — Colorless, clear and flawed, pieces ¼ to ½ lb. in weight, 30c. per lb. in ton lots.
For optical purposes, double above prices.

Rutile—F.o.b. Virginia points, per lb.:
Granular, 94@96 per cent TiO_2, 12@15c.
Pulverized, 100 mesh, 94@96 per cent, 17@30c.
93 per cent TiO_2, $200 per ton, Florida.

Silica—Water ground and floated, per ton, f.o.b. Illinois:
400 mesh, $31.
325 mesh, $25.
250 mesh, $19.
Glass sand, $1@$5 per ton; brick and molding sand, 30c.@$2. Fair.

Spodumene — $20@$30 per ton, depending upon lithium content. Nominal.

Sulphur—$15 per ton for domestic, f.o.b. Texas mines; $19 for export, f.a.s. New York.

Talc—Per ton, in 50-lb. paper bags, *Vermont* mills, carloads:
Ground, 200 mesh, extra white, $11.
180 mesh, medium white, $10.50.
160 mesh, medium white, $10.
If packed in burlap bags, $1 per ton less plus 15c. each for bags.
Prices firm but demand rather quiet.
In *New York*, double air-floated, including containers, per net ton:
200 mesh, $13.75.
325 mesh, $14.75.
Demand fair.

Antimony—Per lb.:
Chinese brands, spot, 17¾@18c.; September, 16¾@17¼c.
Cookson's "C" grade, 19⅝@20c.
Chinese needle, lump, nominal, 14@15c.
Standard powdered needle, 200 mesh, nominal, 17@19c.
White oxide, Chinese, 99 per cent Sb_2O_3, 16@19c.

Bismuth—$2.65@$2.70 per lb. in ton lots. London, 10s.

Cadmium — 60c. per lb. London, 2s. 3d.

Cobalt—Shot, 97@99 per cent, $2.50 per lb. Black oxide, $2.10; gray, $2.35. London, 10s. for metal; 8s. for black oxide; 8s. 10d. for gray. Market fair.

[1]**Germanium Oxide—25 to 50 gm. lots, $6 per gm.**

Iridium—$400 per oz. for 98@99 per cent. Nominal. London, £75.

[1]**Lithium—95@96 per cent grade in 1 to 5 lb. lots, $75 per lb.**

Magnesium—Ingot, 99 per cent, 85c. @$1 per lb. in 100 to 500 lb. lots. Special prices for larger quantities. Market firm.
London, 4s. for 99 per cent ingots or sticks.

[1]**Molybdenum—99 per cent, $25 per kg.**

Monel Metal—32c. per lb.

Nickel—Ingot, 33@34c.; shot, 34@35c.; electrolytic, 38c. (99.75 per cent grade). Market fair. London, £170@£175 per long ton.

Osmiridium—Crude, $58.50 per oz.

Osmium—$105@$110 per oz.

Palladium—$78@$83 per oz. Crude, $65 per oz. London, £16.

Platinum — Refined, $120 per oz. officially quoted. Sales also at $115@$118. Crude, $114.
London, £25 per oz. for refined, and £23 for crude.

Quicksilver—Per 75-lb. flask, $82.50@$83. San Francisco wires $82.67. Quiet. London, £14.

Radium—$70 per mg. radium content.

Rhodium—$90@$95 per oz.

Ruthenium—$75@$85 per oz.

[1]**Selenium** — Black powdered, amorphous, 99.5 per cent pure, $2.10 per lb.

[1]**Tantalum**—Metal sheets, $275 per lb.

Tellurium—$2 per lb.

[1]**Thallium Metal—Ingot, 99 per cent** pure, $4.50 per lb. in 25-lb. lots.

Tungsten Metal—Powder, 97 to 98 per cent, $1.16 per lb. contained tungsten.

[1]**Zirconium Metal**—98 per cent grade, per lb., $30.

Metallic Ores

Chrome Ore—Crude, 45 to 50 per cent Cr_2O_3, $20.50@$23.50 per net ton, f.o.b. shipping point. Ground, in bags, $29.
New Caledonian, 52-54 per cent Cr_2O_3, $24; nominal.
Situation unchanged.

[1]**Galena Radio Crystals—Best quality (50 per cent of sized fragments good) 50c. per lb. in 500-lb. lots, f.o.b. Philadelphia.**

Iron Ore—Lake Superior ores, per long ton, lower Lake ports:
Mesabi, non-bessemer, 51½ per cent iron, $4.25. Old Range, $4.40.
Mesabi, bessemer, 51½ per cent iron, $4.40. Old Range, $4.55.
High-phosphorus foundry, over 0.18 per cent P, $4.15.
Eastern ores, cents per unit delivered at furnaces:
Foundry and basic, 53 to 63 per cent, 9@10c.
Foreign ores, f.o.b. cars Atlantic ports, cents per unit:
Swedish and Norwegian, low-phosphorus, 68 per cent, 11@11½c.
Spanish and Algerian, low-phosphorus, 52@54 per cent, 8@9½c.
Spanish, foundry or basic, 50@54 per cent, 8½@9c.
Swedish foundry or basic, 66@68 per cent, 9@10c.

Manganese Ore—Per long ton unit of Mn, c.i.f. North Atlantic ports:
Brazilian, 42@44c.
Indian, 44c.
Caucasian (unwashed), 42c.
Caucasian (washed), 44c.
Very little business outside of sale of 100,000 tons of Caucasian ore.
Chemical grades[1], powdered, coarse or fine, 82@87 per cent MnO_2, Brazilian and Cuban, $70@$80 per ton in carloads.

Molybdenum Ore—65@70c. per lb. of MoS_2 for 85 per cent MoS_2 concentrates, f.o.b. mines. Market firm.

Pyrite Radio Crystals—50c.@$1 per lb.

Tantalum Ore—Foreign, 75c. per lb. of Ta_2O_5 contained, c.i.f. New York.

Tungsten Ore—Per unit of WO_3, N.Y.:
Ordinary wolframite, $11@$11.50.
High-grade wolframite, $11.50@$12.
Ordinary scheelite, $11.50@$12.
High-grade scheelite, $12@$12.50.
Market very firm, though prices largely nominal.

Vanadium Ore—Minimum 18 per cent V_2O_5, $1@$1.25 per lb. V_2O_5. Nominal.

Non-Metallic Minerals

Prices received for non-metallic minerals vary widely and depend upon the physical and chemical characteristics of the commodity. Hence the following quotations can only serve as a general guide to the prices obtained by producers and dealers in different parts of the United States for their own product. In the last analysis the value of a particular non-metallic mineral can only be ascertained by direct negotiation between buyer and seller.
The net ton of 2,000 lb. is meant unless otherwise stated.

[1]**Amblygonite—8@9 per cent lithium oxide, $50@$60 per ton, f.o.b. mines.**

Andalusite—Sorted, $35@$50 per ton, f.o.b. South Dakota mines.

Asbestos:
Crude No. 1—$450.
Crude No. 2—$250@$300.
Spinning fibers—$150@175.
Magnesia and compressed sheet fibers—$75@$125.
Shingle stock—$55@$75.
Paper stock—$37.50@42.50.
Paper fillers—$20.
Cement stock—$9@$12.
Floats—$8@$12.
Sand—$6@$8.
All per short ton, f.o.b. mine, Quebec, tax and bags included.

[1]Price furnished by Foote Mineral Co., Philadelphia.

No. 1 Rhodesian crude, $310; No. 2, $250 per short ton, c.i.f. New York.
Merger of Canadian properties temporarily held up but negotiations are continuing and it is expected that a basis of settlement will be reached.

Barytes — F.o.b. Kings Creek, S. C., bags extra:
Crude, $7@$8 per gross ton.
Ground, off color, $14@$17 per short ton.
Charlotte, N. C.:
White bleached, $22 per short ton; white natural, $20.
Crude, unground, but washed, lumps and fines, $7.50@$8.50, f.o.b. Ga.
Crude, $8.50, f.o.b. Mo.
Water ground and floated, bleached, $23@$24, f.o.b. St. Louis.
In Canada, 94@96 per cent $BaSO_4$, $9 per net ton, f.o.b. mine.
Demand about normal but all the barium salts are being imported and this curtails use of American ores.

Bauxite — American, f.o.b. shipping point per gross ton:
Crushed and dried, $5.50@$8.50.
Pulverized and dried, $14.
Calcined, crushed, $19@$20.
Foreign, per metric ton, c.i.f.:
Dalmatian, low SiO_2, $5@$6.50.
Istrian, $5.50@$6.50.
Dutch Guiana bauxite offered at $8.50 per long ton, c.i.f. New York. Market active.

Beryl—$70 per ton, hand-sorted crystals, 14 per cent BeO, in ton lots f.o.b. Vermont. Western beryl, of inferior quality, offered at $45 @ $60 per ton. Market quiet. Several new possible sources of beryl reported in Colorado and Africa.

Borax—Crystals, granulated or powdered, in bags, 4¾c. per lb., delivered.

[1]**Celestite—90 per cent $SrSO_4$, finely** powdered, $35 per ton in carload lots.

Chalk—Precipitated, f.o.b. New York, per lb.:
Heavy, 3¼@4c.
Light, 3¾@4½c.
Extra light, 4¼@5c.
Crude, in bulk, $4.75@$5 per ton.

China Clay (Kaolin)—F.o.b. Virginia mines, per short ton:
Crude, lump, No. 1, $7.
Crude No. 2, $5.50.
Washed, $8.
Powdered, $10@$20.
Powdered (Blue Ridge), $10@$14.
Imported English, f.o.b. American ports:
Lump, $12@$19.
Powdered, $45@$50.
1A grades, domestic, $16@$18, f.o.b. mines. Market slow.

Diatomaceous Earth—Per short ton, f.o.b. plant, California:
Kiln-fired brick, $65.
Kiln-fired aggregate, ¼ in., $45.
Insulating powder, $30.
Natural aggregate, ¼ in., $20.
Air-floated powder, $40.
"Calatom" (millrun), $20.
"Calatom," 3b, $30.
Demand fair; becoming more active.

Emery—Per lb., f.o.b. plant:
Greek Naxos, 6½c.
Turkish, 6½c.
Khasia, 5½c.
American, 3½@4c.
Market fairly good.

In *Georgia*, powdered, per ton:
Gray, $8@$10.
Yellow, $9@$12.
Red, $12@$13.
White, $12@$20.
Air-floated, $15@$25.
Market not quite so good as in first half of year.

In *New Jersey*, per ton:
Soapstone, ground, $9@$11.
Serpentine for granite and stucco, $16@$20.
Market fairly good.

Tripoli—Per short ton, burlap bags, paper liners, per minimum carload 30 tons, f.o.b. Missouri:
Once ground through 40 mesh:
Rose and cream colored, $20.
White, $18@$27.
Double ground through 110 mesh:
Rose and cream, $17@$25.
White, $19@$30.
Air-float through 200 mesh:
Rose and cream, $35@$40.
White, $40.
Usual summer dullness but better than last year.

Zircon—Freight allowed east of Mississippi River:
99 per cent, 6c. per lb., f.o.b. Florida.
Powdered, 7c. per lb., f.o.b. Florida.

Mineral Products

Arsenious Oxide (white arsenic)—4c. per lb. delivered. Quiet.

Copper Sulphate—4.30@4.55c. per lb.

Sodium Nitrate—Spot, $2.46 per 100 lb., ex vessel Atlantic ports.

Sodium Sulphate—$1.10@$1.20 per 100 lb., f.o.b. works.

Zinc Oxide—Per lb. in bags:
Lead free, 7¼c.
Leaded grades, 7c.
French, 9⅝@12c.

Ferro-Alloys

[1]**Ferrocerium**—$7 per lb.

Ferrochrome — 0.1 per cent carbon, 35c. per lb. of contained chromium; 2 per cent carbon, 23c. per lb.; 4 to 8 per cent carbon, 11@11½c. per lb.

Ferromanganese—Domestic and foreign, 78@82 per cent, $115 per gross ton. Spiegeleisen, 19@21 per cent, $32@$33, f.o.b. furnace; 16@19 per cent, $31@$32.

Ferrophosphorus—Electrolytic, 18 per cent P, $91 per ton; 24 per cent, $122.50; f.o.b. Ala. and Tenn.

Ferrosilicon—10 to 12 per cent, $33@$37 per gross ton, f.o.b. works; 50 per cent, $82.50@$85 delivered.

Ferrotitanium—For 15 to 18 per cent material, $200 per ton, f.o.b. Niagara Falls, N. Y.

Ferrotungsten—$1@$1.10 per lb. of contained W, f.o.b. works, according to grade.

[1]**Ferro-uranium—30 to 40 per cent U, $4.50 per lb. of U contained, f.o.b. works.**

Ferrovanadium—Per lb. of V contained f.o.b. works: $3.25@$3.75.

[1]Price furnished by Foote Mineral Co., Philadelphia.

Metal Products

Rolled Copper—Sheets, 22½c.; wire, 16c.

Lead Sheets—Full lead sheets, 12½c. per lb.; cut lead sheets, 12¾c. in quantity, mill lots.

Nickel Silver—29c. per lb. for 18 per cent nickel Grade A sheets.

Yellow (Muntz) Metal—Dimension sheets, 19¼c. per lb.; rods, 16⅝c. per lb.

Zinc Sheets — 10¼c. per lb., f.o.b. works.

Refractories

Chrome Brick—$45@$48 per net ton, f.o.b. shipping point.

Firebrick—First quality, $43@$46 per M., Ohio, Kentucky, Central Pennsylvania; second quality, $35@$40.

Magnesite Brick—9-in. straights, $65 per net ton, f.o.b. works.

Silica Brick — $40 per M. Pennsylvania and Ohio; $48@$52 Alabama.

[1]**Zirkite**—Powdered, 80 per cent ZrO_2, 2½c. per lb. Brick, straights, 80c.@$1 each.

Imports and Exports of Metals and Ores in June, 1924 and 1925

Compiled by the U. S. Department of Commerce.

Imports

(Pounds, unless otherwise specified)

	June, 1924	June, 1925
Antimony		
Ore	207,752	126,738
Liquated, regulus, or metal	1,729,504	1,402,816
Copper		
Ores	10,664,657	10,133,717
Concentrates	3,131,390	5,249,966
Regulus	200	.....
Imported from:		
Spain	1,016,234	488,030
Canada	4,043,342	1,936,186
Mexico	1,798,738	2,051,180
Cuba	.....	4,128,320
Chile	6,874,522	6,301,429
Colombia	5,225	560
Peru	57,351	295
Other countries	835	477,683
Unrefined, black, blister and converted copper in pigs, bars, and other forms	52,698,756	24,077,729
From:		
United Kingdom	2,887	21,353
Canada	5,620,891	3,792,221
Mexico	7,802,748	3,895,623
Chile	13,616,153	2,375,583
Peru	8,973,871	4,503,223
Portuguese Africa	16,680,456	8,947,868
Other countries	1,750	541,858
Refined copper	14,475,248	6,700,754
Old and clippings for remanufacture	101,812	386,479
Composition metal, copper chief value	.....	.....
Copper manufactures	18,691	9,461
Brass		
Old and clippings for remanufacture	279,382	617,813
Manufactures of brass	57,718	81,341
Lead		
Ore and matte (lead content)	10,602,526	6,777,343
Bullion or base bullion	15,593,103	7,197,402
Pigs, bars, other forms, and old	2,849	112,049
Manufactures, of, except type metal	24,833	27,084
Manganese ore, long tons	24,726	17,084
Pyrites	25,351	15,478
Tin		
Tin ore	5	18
In blocks, bars and pigs	9,166,754	15,646,612
From:		
United Kingdom	2,521,436	2,732,782
Br. Str. Settlements	5,266,860	10,708,743
Dutch E. Indies	247,163	23,370
Hongkong	866,846	1,834,280
Australia	40,320	33,600
Other countries	224,129	313,837
Zinc		
Ore, free	.....	.....
Dutiable	.....	661,718
Blocks, pigs, and other forms	150	25
Zinc dust	30,545	7,822

Exports

(In Pounds)

	June, 1924	June, 1925
Copper		
Ores, concentrates, comp. metal and unrefined	28,576	293,332
Copper and manufactures of	93,997,302	107,085,409
Refined in ingots, bars and other forms	84,428,285	96,651,953
Exported to:		
Belgium	3,682,792	7,636,906
France	19,697,493	14,215,167
Germany	9,640,613	20,404,161
Italy	14,805,990	14,650,423
Netherlands	3,197,134	8,108,617
Spain	269,144	537,774
Sweden	1,471,468	3,906,553
United Kingdom	19,069,451	18,000,946
Canada	1,173,235	3,350,506
Br. India	2,271	308,238
China	9,597,400	2,749,078
Japan	447,748	1,623,917
Other countries	1,373,546	1,159,667
Old and scrap copper	318,899	1,229,341
Pipes and tubes	297,955	123,056
Plates and sheets	424,426	2,445,270
Rods	5,839,107	4,771,745
Wire	1,407,036	668,829
Insulated copper wire and cable	1,028,070	1,005,351
Other manufactures of copper	253,524	189,864
Lead		
Pigs, bars, and other forms	16,893,012	18,111,931
From domestic ore	1,199,866	511,482
From foreign ore	15,693,146	17,600,449
Exported to:		
France	2,016,379	1,904,585
Germany	1,277,277	3,528,936
Netherlands	560,199	1,254,762
United Kingdom	9,244,181	8,904,820
Other Europe	1,680,563	1,176,316
Argentina	224,000	380,841
Brazil	414,483	672,515
Other countries	1,475,930	289,156
Other lead manufactures	1,359,024	634,090
Zinc		
Dross	.....	1,994,363
Ores and concentrates	1,049	360
Zinc (spelter) in slabs, blocks, or pigs	5,508,440	10,363,661
Exported to:		
Belgium	446,373	280,008
France	1,902,059	1,545,959
Italy	1,165,089	628,156
Germany	1,289,052	2,800,982
United Kingdom	.....	3,153,887
Canada	70,412	18,201
Other countries	635,455	1,936,468
In sheets, strips, and other forms	572,546	540,021
Zinc dust	367,698	274,408
Other zinc manufactures	98,091	34,398

Metal Statistics

Monthly Average Prices of Metals

Silver

	New York		London		Sterling Exchange	
	1924	1925	1924	1925	1924	1925
January	63.447	68.447	33.549	32.197	425.524	477.702
February	64.359	68.472	33.565	32.245	430.457	476.886
March	63.957	67.808	33.483	31.935	428.769	477.279
April	64.139	66.899	33.065	31.372	434.788	479.034
May	65 524	67.580	33.870	31.276	435 716	484.960
June	66.690	69.106	34.758	31.863	431.675	485.553
July	67.159	69.442	34.509	31.954	436.649	485.514
August	68.519	.....	34.213	.....	449.510	.....
September	69.350	.....	34.832	.....	445.740	.....
October	70.827	.....	35.387	.....	448.274	.....
November	69.299	.....	33.775	.....	460.543	.....
December	68.096	.....	32.620	.....	469.115	.....
Year	66.781	.....	33.969	.....	441.397	.....

New York quotations, cents per ounce troy, 999 fine, foreign silver. London, pence per ounce, sterling silver, 925 fine.

Copper

	New York Electrolytic		London Standard		London Electrolytic	
	1924	1925	1924	1925	1924	1925
January	12.401	14.709	61.273	66.065	67.193	70.607
February	12.708	14.463	63.113	64.713	68.167	69.525
March	13.515	14.004	66.137	62.892	72.087	67.739
April	13.206	13.252	64.338	60.575	70.150	64.194
May	12.772	13.347	62.006	60.131	67.648	63.560
June	12.327	13.399	61.375	59.899	66.313	63.369
July	12.390	13.946	61.652	61.467	65.815	65.750
August	13.221	.....	63.481	.....	67.800	.....
September	12.917	.....	62.750	.....	67.125	.....
October	12.933	.....	62.641	.....	66.620	.....
November	13.635	.....	63.731	.....	68.063	.....
December	14.260	.....	65.295	.....	69.762	.....
Year	13.024	.....	63.149	.....	68.062	.....

New York quotations, cents per lb. London, pounds sterling per long ton.

Lead

	New York		St. Louis		London	
	1924	1925	1924	1925	1924	1925
January	7.972	10.169	8.002	9.953	31.528	41.443
February	8.554	9.428	8.643	9.126	34.589	37.944
March	9.013	8.914	8.891	8.578	37.161	36.804
April	8.263	8.005	7.932	7.662	32.819	32.791
May	7.269	7.985	6.973	7.780	29.426	32.283
June	7.020	8.321	6.848	8.024	32.138	33.479
July	7.117	8.151	6.886	8.054	32.916	34.698
August	7.827	.....	7.764	.....	32 728	....
September	8.00	.....	7.876	.....	33.023	.....
October	8.235	.....	8.118	.....	35.715	.....
November	8.689	.....	8.590	.....	39.425	.....
December	9.207	.....	9.106	.....	41.583	.....
	8.097	.....	7.969	.....	34.421	.....

New York and St. Louis quotations, cents per lb. London, pounds sterling per long ton.

Tin

	New York 99%		New York Straits		London	
	1924	1925	1924	1925	1924	1925
January	48.250	57.692	48.750	58.250	246.790	265.560
February	52.772	56.517	53.272	57.068	272.399	262.181
March	54.370	53.038	54.870	53.733	277.429	245.682
April	49.457	51.380	49.957	52.135	250.863	237.006
May	43.611	53.675	44.111	54.620	218.511	245.476
June	42.265	54.885	42.765	55.957	219.219	252.476
July	45.750	56.683	46.250	58.014	233.332	258.435
August	51.409	.....	51.909	.....	254.638	.....
September	48.595	.....	49.095	.....	243.511	.....
October	50.038	.....	50.538	.....	248.543	.....
November	53.848	.....	54.348	.....	257.738	.....
December	55.721	.....	56.245	.....	261.875	.....
Year	49.674	.....	50.176	.....	248.737	.....

New York quotations, cents per lb. London, pounds sterling per long ton.

Zinc

	St. Louis		London	
	1924	1925	1924	1925
January	6.426	7.738	34.761	37.917
February	6.756	7.480	36.518	36.528
March	6.488	7.319	35.298	35.741
April	6.121	6.985	32.588	34.644
May	5.793	6.951	30.648	34.223
June	5.792	6.990	31.788	34.149
July	5.898	7.206	32.193	34.894
August	6.175	.....	32.544	.....
September	6.181	.....	32.926	.....
October	6.324	.....	33.514	.....
November	6.796	.....	35 022	.....
December	7.374	.....	36.932	.....
Year	6.344	.....	33.728	.....

St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Antimony, Quicksilver and Platinum

	Antimony (a) New York		Quicksilver (b) New York		Platinum (c) Refined New York		Platinum (c) Crude
	1924	1925	1924	1925	1924	1925	1925
January	10.279	17.428	59.500	81.596	122.115	117.000	111.663
February	10.935	19.795	59.565	79.386	124.739	117.000	114.216
March	11.442	15.553	64.269	80 481	121.692	117.000	115.000
April	9.952	12.553	74.308	82.327	115.577	118 269	114.769
May	8.755	15.770	76.962	81.360	115.731	119.850	115.000
June	8.403	16.500	73.720	83.154	116.000	120.000	115.000
July	8.477	17.779	72.173	83.077	118.231	120.000	114.346
August	9.839	.....	72.096	.....	120.000	.....	.....
September	11.022	.....	72.423	.....	118.923	.....	.....
October	11.519	.....	70.654	.....	118.000	.....	.....
November	14.385	.....	68.708	.....	117.792	.....	.....
December	15.024	.....	72.750	.....	117.000	.....	.....
Year	10.836	.....	69.761	.....	118.817	.....	.....

(a) Antimony quotations in cents per lb. for ordinary brands. (b) Quicksilver in dollars per flask. (c) Platinum in dollars per ounce.

Pig Iron, Pittsburgh

	Bessemer		Basic		No. 2 Foundry	
	1924	1925	1924	1925	1924	1925
January	24.76	24.66	23.76	23.76	23.88	23.76
February	25.26	24.50	23.76	23.26	25.06	23.76
March	25.14	24.06	23.76	23.06	24.76	22.91
April	24.56	22.89	23.26	21.76	23.80	22.26
May	23.89	21.57	22.08	20.26	22.91	21.16
June	22.90	20.76	21.49	19.76	21.48	20.11
July	21.90	20.76	20.76	19.76	20.76	20.26
August	21.76	.....	20.76	.....	20.99	.....
September	21.76	.....	20.76	.....	21.68	.....
October	21.76	.....	20.26	.....	21.26	.....
November	22 08	.....	21.44	.....	21.17	.....
December	23.65	.....	22.04	.....	22.86	.....
Year	23.28	.....	22.01	.....	22.55	.....

In dollars per long ton.

Monthly Crude Copper Production

Domestic

	1925 March	April	May	June
Alaska shipments	11,177,011	7,329,681	5,756,693	5,694,810
Calumet & Arizona	3,416,000	5,196,000	4,410,000	3,848,000
Miami	4,428,000	4,388,000	4,419,000	4,391,000
New Cornelia	6,489,000	6,335,821	6,691,648	6,230,956
Old Dominion	3,152,000	2,550,000	2,836,000	2,762,000
Phelps Dodge	13,786,000	13,797,000	14,108,000	14,428,000
United Verde Extension	3,368,904	3,810,358	3,625,252	3,130,812
A.S. & R. & Tenn. Copper	15,500,000	15,500,000	13,200,000	13,368,000
Imports: Ore and concentrates, matte	8,496,693	18,022,747	25,276,355	13,796,247
Imports of black and blister, unrefined	27,513,110	40,255,461	31,412,309	52,698,756
Imports of refined and old	9,044,000	8,508,750	8,771,697	14,595,751

Foreign

Boleo, Mexico	1,551,769	110,250	.....	1,694,000
Falcon Mines, Rhodesia	438,000	.....	.....	.....
Furukawa, Japan	2,930,286	3,367,833	2,630,688	.....
Cons. M. & S., Canada	.....	.....	.....	.....
Granby Cons., Canada	2,938,903	3,316,290	3,529,582	.....
Katanga, Africa	15,922,305	15,435,000	17,996,160	18,830,876
Mount Morgan, Aust.	544,000	722,000	998,000	901,000
Mount Lyell, Aust.	800,000	1,366,000	1,366,000	1,366,000
Phelps Dodge, Mexican	3,983,000	3,283,000	3,147,000	3,528,000
Sumitomo, Japan	1,888,021	2,445,236	1,139,675	2,823,630

Monthly Production of Primary Copper from U. S. Mines and Daily Rate

	1923 Monthly Production	1923 Daily Rate	1924 Monthly Production	1924 Daily Rate	1925 Monthly Production	1925 Daily Rate
January	56,134	1,811	66,631	2,149	74,789	2,414
February	51,368	1,834	65,681	2,265	68,967	2,463
March	60,781	1,961	65,181	2,103	74,901	2,416
April	59,078	1,969	66,073	2,202	70,551	2,352
May	62,718	2,023	65,608	2,116	70,033	2,259
June	62,740	2,091	63,933	2,131	70,322	2,344
July	63,071	2,034	64,787	2,090	.....	.....
August	65,865	2,125	66,756	2,153	.....	.....
September	62,255	2,075	63,800	2,127	.....	.....
October	66,035	2,130	68,989	2,225	.....	.....
November	63,885	2,129	68,291	2,276	.....	.....
December	64,832	2,091	67,647	2,182	.....	.....
Total	738,763	2,024	793,377	2,168	429,563	2,373
Monthly average	61.564	.....	66.115	.....	71,594	.....

Mining Stocks—Week Ended August 1, 1925

Stock	Exch.	High	Low	Last	Last Div.
COPPER					
Anaconda	New York	42¼	40⅜	41½	Jy.18, Au.24, Q 0.75
Arcadian Consol.	Boston	1⅛	1⅛	1⅛	
Ariz. Com'l.	Boston	11⅛	10⅞	11	Jy.21, Jy 31 SA 0.50
Calaveras	N. Y. Curb			2	
Calumet & Arizona	New York	50⅜	48⅜	49	Jn.15, Jn.22 Q 0.50
Calumet & Hecla	Boston	15⅝	14⅝	14½	Ja.30, Mh.4 0.50
Canario Copper	N. Y. Curb	7⅜	7¼	7½	
Cerro de Pasco	New York	53½	51⅛	52½	Au.21, Se.1, Q 1.75
Chile Copper	New York	34⅛	33¼	33⅞	Sep. 2, Sep. 28, Q 0.62½
Chino	New York	24	22½	22⅞	Sept., 1920 0.37½
Con. Coppermines	N. Y. Curb	2¼	2¼	2¼	
Copper Range	Boston	21¼	20⅛	20¼	Ap.9, My.4 1.00
Crystal Copper	Boston Curb	*50	*47	*48	
East Butte	Boston	3½	3½	3½	Dec., 1919 0.50
First National	Boston Curb	*19	*16	*18	Feb., 1919 0.15
Franklin	Boston	*80	*80	*80	
Granby Consol.	New York	16¼	14⅜	16¼	May, 1919 1.25
Greene-Cananea	New York	13⅜	13¼	13⅜	Nov., 1920 0.50
Hancock	Boston			*76	
HoweSound,new,r t.c.	N. Y. Curb			16¼	April, 1924 0.05
Inspiration Consl.	New York	29	27⅛	27⅞	Jn.18, Jy.6, Q 0.50
Iron Cap	Boston Curb	1⅛	1 1/16	1⅛	May, 1923 0.15
Isle Royale	Boston	13¼	12	12	Sept., 1923 0.50
Jerome Verde Dev.	N. Y. Curb	1	1	1	
Kennecott	New York	54	53	53⅞	Jn.5, Jy.1, Q 0.75
Lake Copper	Boston	1⅛	1⅛	1⅛	Jn.1, Jn.15 Q 0.50
Magma Copper	NewYork	42	41	41½	Jn. 15, Jy. 15, 0.75
Mason Valley	N. Y. Curb	2	1⅞	1⅞	
Mass Consolidated	Boston			*70	Nov., 1917 1.00
Miami Copper	New York	10⅜	9⅛	10⅛	Au.1 Au.15 Q 0.25
Mohawk	Boston	32⅛	30	31⅛	Aug. 1, Sept. 2 1.00
Mother Lode Con.	New York	8⅛	7⅞	8⅛	Jn. 12, Jn. 30 0.37½
Nevada Consol.	New York	13⅞	13	13⅜	Sept., 1920 0.25
New Cornelia	Boston	20	19¾	19¾	Aug. 7, Aug. 24 0.25
North Butte	Boston	1⅛	1	1	Oct., 1918 0.25
Ohio Copper	N. Y. Curb	*82	*76	*77	No.14, De.2 0.05
Old Dominion	Boston	20	19	19	Dec., 1918 1.00
Phelps Dodge	Open Mar.	†110	†105		Jn.20, Jy.2 Q 1.00
Quincy	Boston	24½	24	24	Mar., 1920 1.00
Ray Consolidated	New York	14⅝	14	14	Dec., 1920 0.25
Ray Hercules	N. Y. Curb			14	
St. Mary's Min. Ld.	Boston	36	35	35½	Ap. 20, My.20, 3.00
Shannon	Boston	*61	*60	*61	Nov., 1917 0.25
Shattuck Arizona	New York	6⅞	6⅜	6⅛	Jan., 1920 0.25
Superior & Boston	Boston	1⅛	1⅛	1⅛	
Tenn. C. & C.	New York	11⅛	10⅞	11	De.31, Ja.15,Q 0.25
United Verde Ex.	N. Y. Curb	23¼	23⅛	23⅛	Jy. 6, Aug. 1 0.50
Utah Copper	New York	95	95	95	Mh.20,Mh.31,Q 1.00
Utah Metal & T.	Boston	*50	*45	*50	Dec., 1917 0.30
Victoria	Boston	*32	*30	*30	
Walker Mining	Salt Lake	2 52⅛	2.50	252½	
NICKEL-COPPER					
Internat. Nickel	New York	32	29⅜	31⅜	March, 1919 0.50
Internat. Nickel pfd.	New York			98¼	Jy.16, Au.1, Q 1.50
LEAD					
Carnegie Lead & Zinc	Pittsburgh	7⅛	7	7	
Gladstone M. M. Co.	Spokane	*23⅜	*23⅛	*23	Jy. 1, Jy. 10 0.0⅛
National Lead	New York	153¾	149	151	Sep.11, Sep.30 2.00
National Lead pfd.	New York	118	118	118	Aug.21, Sep.15 1.75
St. Joseph Lead	New York	41¾	40	41	Jn.9, Jn.22, 0.50
ZINC					
Am. Z. L. & S.	New York	8⅛	7⅞	8⅛	May, 1920 1.00
Am. Z. L. & S. pfd.	New York	29⅛	27¼	27½	Nov., 1920 1.50
Butte C. & Z.	New York	5⅝	5⅛	5⅝	De.10, De.24 0.50
Butte & Superior	New York	11⅛	10⅜	10⅜	Mh.19, Mh.31 0.50
Callahan Zn-Ld	New York	2⅜	2⅛	2⅜	Dec., 1920 0.50
New Jersey Zn.	N. Y. Curb	191¼	190	190	Jn.20,Jy. 10 Ex. 2.00
United Zinc	N. Y. Curb			*35	
Yellow Pine	Los Angeles	*70	*70	*70	De.10,De.15 Q 0.04
GOLD					
Alaska Juneau	New York	1⅜	1⅜	1⅜	
Argonaut	Toronto	*25⅜	*24⅛	*25	
Barry-Hollinger	Toronto	*45	*44	*44	
Carson Hill	Boston	*25	*25	*25	
Consol. W. Dome L.	Toronto	*14¼	*13¾	*14⅜	
Cresson Consol. G.	N. Y. Curb	3¼	3⅛	3¼	Mh.31, Ap.10 Q 0.10
Crown Reserve	Toronto	*18⅜	*17	*18⅛	Jan. 1917 0.05
Dome Mines	New York			15	Mh.31,Ap.20,Q 0.50
Golden Cycle	Colo. Springs			1.48	Dec.11, 1924 0.03
Hollinger Consol.	Toronto	14.85	14.75	14.80	Jy.27, Au.12 0.08
Homestake Mining	New York	44	43¾	44	Jy.20 Jy.25 M 0.50
Kirkland Lake	Toronto	*43½	*41	*42½	
Lake Shore	Toronto	18.90	18.50	18.80	Mh.2, Mh.16. 0.05
McIntyre-Porcupine	New York	19¼	18⅜	19	Aug.1, Sept.1 0.25
Newray	Toronto	*22⅜	*22⅛	*22⅛	
Night Hawk Pen.	Toronto	*23	*21	*21	
Portland	Colo. Springs	*43	*43	*43	Oct., 1920 0.01
Rand Mines	New York	38	38	38	Fe.17, Fe.25 1.79
Teck-Hughes	Toronto	1.78	1.68	1.75	
Tom Reed	Los Angeles	*65	*58	*60	Dec., 1919 0.02
Tough-Oakes	Toronto	*38	*34½	*37	
United Eastern	N. Y. Curb			*47	July, 1924 0.05
Vipond Cons.	Toronto	1.22	1.17	1.21	
Wright-Hargreaves	Toronto	5.15	4.95	5.10	Jn.15, Jy.1 5.00
GOLD AND SILVER					
Black Oak	N. Y. Curb			*81	
Con. Cortez	N. Y. Curb	*7	*7	*7	
Con. Virginia	San Francisco	4½	4½	4½	
Continental Mines	N. Y. Curb			1⅜	
Dolores Esperanza	N. Y. Curb	*65	*60	*60	July, 1923 0.05
Premier Gold	N. Y. Curb	2⅜	2 1/16	2⅛	Jn.18, Jy.1, 0.08
Tonopah Belmont	N. Y. Curb	*68	*60	*68	Sep. 15, Oct. 1, 0.05
Tonopah Divide	N. Y. Curb			*23	Oct., 1923 0.10
Tonopah Extension	N. Y. Curb	1⅜	1⅜	1⅜	Mh.11, Ap.1, Q 0.05
Tonopah Mining	N. Y. Curb	3⅜	3⅜	3⅜	Mh.31, Ap.21, 0.07½
Unity Gold	N. Y. Curb	*85	*70	*80	
West End Consol.	N. Y. Curb	*56	*50	*50	Mar., 1923 0.05
Yukon Gold	N. Y. Curb			*35	June, 1918 0.02

Stock	Exch.	High	Low	Last	Last Div.
SILVER					
Alvarado	Boston Curb			*50	Oct. 1920 0.50
Beaver Consol.	Toronto	*32½	*31	*32½	May, 1920 0.03
Castle-Trethewey	Toronto	*93½	*90	*93	
Coniagas	Toronto	1.65	1.65	1.65	May, 1924 0.12½
Keeley	Toronto	1.81	1.75	1.80	Mh.1, Mh.15SA 0.12
Kerr Lake	N. Y. Curb			1⅛	Ap.1, Ap.15, Q 0.12½
La Rose	Toronto	*45½	*44	*45	Apr., 1922 0.10½
Lorrain Trout Lake	Toronto	*99	*90	*90	Jy. 2, Jy.15 0.05
McKiniey-Dar.-Sav.	Toronto	*28	*26	*27½	Oct., 1920 0.03
Mining Corp. Can.	Toronto	2.55	2.50	2.52	Jy.1, Jy.15 0.12½
Nipissing	N. Y. Curb	4⅞	4½	4⅞	Jn.30, Jy.20, Q 0.15
Ontario Silver	New York	7⅛	7	7	Jan., 1919 0.50
Temiskaming	Toronto	*16½	*16	*16	Jan., 1920 0.40
SILVER-LEAD					
Ahumada	New York			10⅜	Jn.15,Jy.2,QEx 0.25
Bingham Mines	Boston	29½	29	29½	Jn.20, Jn.30 Q 0.50
Cardiff M. & M.	Salt Lake	1.45	1.35	1.40	De.16, No.18 0.10
Chief Consol.	Salt Lake	3.00	2.90	2.90	Ap.10, My. 1 0.10
Columbus Rexall	Salt Lake	*8⅛	*7	*7	Aug., 1923 0.05
Eruption	Boston Curb	3⅛	2⅛	2⅞	Jn.15,Jy.2,QEx 0.25
Federal M. & S.	New York			17½	Fe.26, Mh.15 Q 1.75
Federal M. & S. pfd.	New York	56¾	55	55¾	My.25, Jn.15,Q 1.75
Hecla Mining	N. Y. Curb	15¾	14¾	15¾	My.15, Je.15 Q 0.50
Iron Blossom Con.	Salt Lake			*39	Oc.25, 1924 0.01½
Iron King Mining	Salt Lake	*50	*48	*48	
Keystone Mining	Salt Lake	*75	*73	*74	Au.12, Au.26 0.07½
Mammoth Mining	Salt Lake	2.65	2.57½	2.60	My.15 My.25 0.10
Marsh Mines	N. Y. Curb			*4	June, 1921 0.02½
Park City	Salt Lake	5.80	5.80	5.80	Jn.15, Jy.1 Q 0.15
Park Utah	Salt Lake	5.95	5.80	5.90	April, 1924 0.15
Prince Consol.	Salt Lake	*46	*40	*42	
Silver King Coal	Salt Lake	8.10	8.00	8.00	Jn.20, Jy.1, Q 0.25
Silversmith	Spokane	*19⅜	*19½	*19⅜	Jy.1, Jy.10 0.01
Tamarack-Custer	Spokane	*73	*60	*60	Sept, 1924 0.25
Tintic Standard	Salt Lake	11.37½	11.25	11.37½	Jn.24, Jn.29 Q 0.40
Utah-Apex	Boston	6	5⅛	5⅛	Jy.3, Jy.15, Q 0.35
Western Utah Copper	N. Y. Curb			*11	
IRON					
Bethlehem Steel	New York	43¾	44½	45⅜	July, 1924 1.25
Char. Iron	Detroit			*20	
Char. Iron pfd.	Detroit			*85	
Colorado Fuel & Iron	New York	44¼	40½	43½	May, 1921 0.75
Gt. North'n Iron Ore	New York	69⅞	68½	69¼	Ap.11, Ap.30 1.00
Inland Steel	New York	43	41½	41½	Au.14,Sep.1,Q 0.62½
Mesabi Iron	N. Y. Curb	2½	2½	2½	
Replogle Steel	New York	15½	14¼	14⅜	
Republic I. & S.	New York	49½	47⅛	47⅛	May, 1921 1.50
Republic I. & S. pfd.	New York	90	89⅞	90	Jn.17, Jy.1, Q 1.75
Sloss-Sheffield S. & I.	New York	106	101½	101⅞	Jn.10, Jn.20 Q 1.50
Sloss-Shef. S.&I. pfd.	New York	98	97½	97½	Jn.20, Jy.1, Q 1.75
U. S. Steel	New York	120⅜	117¼	118½	Au.29,Au.31,Q Ex 1.75
U. S. Steel pfd.	New York	125¼	124⅜	125	Aug. 3, Aug. 29, Q 1.75
Virginia I. C. & C.	New York			31	Jan., 1924 1.50
Virginia I.C.&C.pfd.	New York			73	Jn.20, Jy.2, 2.50
VANADIUM					
Vanadium Corp.	New York	31¼	30¼	30½	Aug.1, Aug.15 0.50
ASBESTOS					
Asbestos Corp.	Montreal			75	My.1, My.15 Q 1.00
Asbestos Corp., pfd.	Montreal			107½	Ap. 1, Ap. 15, Q 1.50
SULPHUR					
Freeport Texas	New York	15⅛	14½	14⅞	Nov., 1919 1.00
Texas Gulf	New York	112	107⅜	108⅞	Jn.1, Jn.15, Q 1.75
DIAMONDS					
De Beers Consol.	New York	21¼	21⅛	21¼	Jy.27, Au.30 0.97
PLATINUM					
So. Am. Gold & P.	N. Y. Curb	2⅜	2⅛	2⅜	
MINING, SMELTING, REFINING AND GENERAL					
Amer. Metal	New York	49⅛	49¼	49¼	Aug. 20, Sep. 1, Q 0.75
Amer. Metal pfd.	New York	113⅜	110	111⅞	Aug. 21, Sep. 1, Q 1.75
Amer. Sm. & Ref.	New York	105⅜	102⅜	103⅝	Jy.10, Au.1, Q 1.50
Amer.Sm.&Ref.pfd.	New York	111	110⅛	111	Au.7, Se.1, Q 1.75
Consol. M. & S.	Montreal			102	Jn.30, Jy.15 0.75
Federated Metals	N. Y. Curb			25	
Newmont Mining	N. Y. Curb	44½	43⅛	43⅜	
Southwest Metals	N. Y. Curb			1	
U. S. Sm. R. & M.	New York	39⅛	37⅞	37⅞	Jy.6, Jy.15 Q 0.75
U.S. Sm. R.&M.pfd.	New York	46⅛	46	46	Jy.6, Jy.15 Q 0.87½

* Cents per share. † Bid or asked. Q. Quarterly. SA. Semi-annually. M. Monthly. K. Irregular. I. Initial. X. Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange and George H. Watson & Co.; Colorado Springs, Colorado Springs Stock Exchange

LONDON QUOTATIONS, WEEK ENDED JULY 10

	High	Low	Last	Date	Per Cent
Aramayo Mines (25 frs.)	77/6	76/3	77/6	May 1925	5(c)
British Platinum	7/6	7/—	7/6	Feb. 1925	2½
Bwana M'Kubwa	5/6	5/—	5/1½		
Camp Bird	2/3	2/—	2/1½		
El Oro	5/—	4/7½	5/—	Nov. 1924	2½*
Esperanza	1/—	—/10½	1/—		
Frontino & Bolivia	11/6	11/3	11/6	July 1925	3¾
Mexican Corporation	13/4½	12/—	13/3		
Mexico Mines of El Oro	37/6	29/3	37/6	June 1925	10*
Nechi (pref. 10s.)	1/3	1/—	1/3	1921-22	25
Oroville Dredging	7/3	6/10½	7/3	Dec. 1923	3¾
Ouro Preto	5/—	4/9	5/—	May 1925	2½
St. John del Rey	15/7½	14/10½	15/6	June 1925	6½
San Francisco Mines	23/3	22/7½	23/—	June 1925	15
Santa Gertrudis	9/9	9/3	9/6	July 1920	5
Selukwe (2s. 6d.)	10/7½	9/6	10/—	April 1917	6¾
S. American Copper	7/9	6/9	7/9	Nov. 1917	75
Tanganyika	35/7½	28/9	33/11½		
Tomboy	4/9	4/4½	4/9	Feb. 1925	4½
Union Minière du Haut-Katanga (Brussels) 100 Fr.	9.995	5.500	5.995	July 1925	150(b)

* Free of British income tax. (b) Belgian francs. (c) Swiss francs.